Food Adulteration.

What We Eat,
or
What We Should Eat.

A Housekeeper's Hand Book.

FOOD

ADULTERATION:

OR,

WHAT WE EAT, AND WHAT WE SHOULD EAT!

BY J. T. PRATT.

"Measures for the protection of the public health can be carried out only so far as the public receives instruction in sanitary matters, and is thus prepared to give intelligent and willing co-operation."

—*Dr. O. W. Wight.*

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AN ARGUMENT.

With the assistance of several gentlemen of recognized skill and large experience, both in the laboratory and with the microscope, the writer has endeavored to make such an investigation of the subject of food adulteration as would enable him to present to the public a popular rather than a scientific treatise thereon. Believing the subject to be one which concerns all, he has endeavored to discuss it in a manner comprehensible by all.

His investigations were not conceived, nor have they been prosecuted, in a spirit of fanaticism. The search he has made for the bad, has been a search for the good as well. With no prejudice, and no presumption of guilt in any case, he has simply endeavored to arrive at just and defensible conclusions. He has sought for nothing more and for nothing less than the facts, and it has been equally his aim to state nothing more and nothing less than the truth.

The facts, as he has found them, require no exaggeration. They are astounding and sensational enough for all purposes, and furnish every argument that is needed to support a demand for the correction of a great and growing evil.

The gross adulteration of almost every article that enters into the alimentary economy of the household, the insidious introduction into the human system of impurities and poisons destructive of health, the unblushing frauds perpetrated by those who are

jealous of their standing in society and in the church, the undermining of the physical powers of the young, as well as the old, present an exhibition of recklessness and criminality, and suggest a state of public morals worthy of the days of Herod or the Borgias, but ill becoming the nineteenth century.

The law is careful to provide a penalty for every crime against life, property, and morality, and to follow infraction with prosecution. Why, then, should these crimes against health alone go unpunished ?

When it is borne in mind that almost every household in the land is affected by this evil, that its victims are found in the higher no less than in the lower walks of life, among the intelligent as well as the ignorant, it becomes a matter of the most profound astonishment that the public mind and public conscience have been so little disturbed by its prevalence; that nothing like a national sentiment has been aroused to demand corrective national legislation.

The governments of Great Britain, France and other nations of the Old World, more careful of the health of their subjects and their citizens, and appreciating the pernicious effects of the daily consumption of impure and poisoned food, have enacted laws to check the practice of adulteration. Among enlightened nations we would seem, indeed, to stand alone in our neglect of this national duty.

If such safeguards are requisite and salutary in France and England, can it be said that they are needed less in our own country? May it not be said rather that there is greater need for them, when we consider the peculiarities of our people and our institutions, when we bear in mind how slight the barrier is between Liberty and License, and how easily personal freedom may be construed into "the right to do wrong." The critic of our system of government would be justified in instituting a comparison here which would not be flattering, either to our wisdom or our integrity as a people.

Many of the arts practiced by the American adulterators of

food have been borrowed, in fact, are the cast-off practices of the former adulterators of the Old World. While we have imported these evil arts, it is a sad reflection that we have not imported also the salutary laws restraining them.

This shutting off of the foul current from its former outlets in the Old World has caused it to seek new channels, and it is hardly necessary to state that our own country has become the natural reservoir, not only of the impure and fraudulent products of manufacturers at home, but of those of the foreign producer and adulterator as well. Articles, the sale of which is interdicted in France and Great Britain, are shipped in quantities from those countries to the United States. The Chinese merchant has learned that he must furnish one character of tea for English consumption, while he can with impunity supply the American market with quite another. The dregs of the wine tanks of France, which cannot be placed in any market of the Old World, are doctored up and shipped at a profit to us; while much of the alcohol annually exported by the American distiller, is returned to us colored, flavored and branded as brandy. These are facts well understood in other countries, if they are not in our own. Cheapness, which invariably signifies inferiority, is understood to be the only requisite in supplying the American market, and all competition is simply narrowed down to a struggle as to who can produce the nearest to a worthless article.

Occasional and meagre exposures of the deceptions and impositions practiced by the manufacturers and purveyors of food have been made through the columns of the public press. These revelations have awakened a passing local interest in the subject, and have, for the time being, been attended with some wholesome results. Several of the States and many of the larger cities have enacted laws and ordinances intended to reach the evil as a whole, or suppress the sophistication and corruption of specific articles. The latter observation will apply particularly to the article of milk. Sanitary considerations have also induced the establishment in nearly all the larger cities of a system of meat inspection.

In some instances these regulations are enforced with more or less rigor, but in the great majority of cases they are little more than dead letters, affording no protection to the consumer and causing no uneasiness to the purveyor.

Under the protection afforded by the general government to inter-state commerce, all state legislation must necessarily prove futile and inoperative, only in so far as it affects articles manufactured and sold within the commonwealth adopting such measures. Under a law of Illinois, we very much question, whether a conviction could be secured, based upon the sale in Chicago, of adulterated goods manufactured in, and shipped from, the neighboring State of Michigan. We are quite certain that confiscation of the stuff would be impossible. If the manufacturer, a non-resident of Illinois, could, under any pretext, establish a claim upon or interest in the goods, it would be a very simple matter for him to transfer the case to the Federal Courts, where the proceedings would necessarily end.

The only method of reaching the evil to check or eradicate it, is by national legislation; the passage of a law, the operation of which shall not be restricted either by municipal or state lines.

Elsewhere we give the text of a bill introduced in the National House of Representatives, by Mr. Beale, on the 23d of May, 1879. In these pages we also give the full text of the amended adulteration act of Great Britain.

The ravages of the fever scourge, which swept over a portion of the South in 1878, called into existence a National Board of Health. This board, in effecting an organization, appointed from among its members, a committee on Food Adulteration, of which Dr. H. A. Johnson, of Chicago, was made the chairman,—a gentleman fully qualified to consider the subject in all its relations to public health and public morals. But what can we expect from this committee or from the National Board in the absence of all legislation on the subject? Have we not here the somewhat ridiculous picture of a king without an empire, an executive power called into existence without a law to execute? With the requisite

legislation, we can readily see how the existing committee of the National Board could render most valuable service to the whole country.

Is not the prevailing practice of food sophistication, affecting as it does all sections, and invading those regions where no deadly malaria poisons the life-giving air, even a greater evil and scourge than the dreaded periodical visitant of the South? Are we prepared to say that its victims are less numerous or its ravages less appalling?

The plague of the South has brought into existence a wise enactment by Congress and a board of sanitarians to enforce its provisions. Shall the demands of the whole country for legislation, to protect all sections against as great and ghastly an evil, be disregarded?

With reference to the bill introduced by Mr. Beale, while we regard it as defective in not defining in exact terms what shall constitute adulteration, what adulterants in common use shall be interdicted, and in not requiring all articles of food to be labeled and sold for exactly what they are, whether the ingredients be harmful or harmless, we should nevertheless hail with pleasure its passage as possibly the opening wedge, the initiatory to more thorough and comprehensive legislation.

We are of opinion that the Government should go much further than Mr. Beale proposes to have it go; that public inspectors should be appointed, whose duty it should be to exercise a scrutiny and surveillance over all manufactories and places where food is produced, with power to arrest violators of the law and to seize contraband and poisonous material when found upon the premises.

The true economist can offer no objection to the appointment and maintenance of such a sanitary corps. The Government, to protect itself against being defrauded of its revenues, employs an army of agents, at an expense of many thousands of dollars annually. Is not the health of a people of greater consideration than the revenues? Is there any loss which a nation can suffer comparable to that of the health and manhood of its citizens?

Dr. Parkes, an eminent writer upon hygiene, very truthfully observes, that "it has been proved over and over again that nothing is so costly in all ways as disease, and that nothing is so remunerative as the outlay which augments health."

Dr. Boardman, in a paper contributed to the Sixth Annual Report of the Massachusetts State Board of Health, demonstrated that the yearly loss to that commonwealth by preventable sickness, is considerably more than $3,000,000. How much of this sickness and this loss to the State is attributable to the effects of impure and adulterated food cannot be stated, but that it is very considerable there cannot be a doubt.

But abandoning all consideration of reimbursement, and rising to a higher plane of reasoning, we can but echo the noble sentiment of Dr. Wight, of Milwaukee, that "above all material saving, is the far higher consideration, the diviner economy of human suffering and anguish."

To the legislator, ambitious of serving his country, to the patriot and lover of his fellow men, let us commend the remark of Dr. Farr, that "the hope of saving any number of human lives is enough to fire the ambition of every good man who believes in human progress."

We will now proceed to the consideration of the articles of food most adulterated, after which we will give some attention to the causes stimulating the practice, to its moral effects and its effect upon the commerce of the country, and also to the responsibility of the consumer in the premises.

Before doing this, the writer would gratefully acknowledge the assistance rendered him by a number of intelligent and earnest co-laborers in this much needed reform, and particularly to Dr. R. U. Piper, Dr. T. D. Williams, and Prof. Geo. A. Marriner, of Chicago, Dr. O. W. Wight, of Milwaukee, and Mr. Geo. T. Angell, the devoted humanitarian of Boston. To the first-named gentleman he is indebted for the entire first chapter of the work, including the original microscopic drawings.

FOOD ADULTERATION:

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WHAT WE EAT, AND WHAT WE SHOULD EAT.

CHAPTER I.

OLEOMARGARINE.

We are not surprised that the ordinary mind cannot grasp and understand so grand a discovery, which is in direct conflict with the recognized method of making butter.—*Prof. Mott.*

In the discussion of this substance, which modern ingenuity has put forward as an article of food to take the place of butter, it may be well, perhaps, in the first place, to set down what its producers claim for it, and to give, as far as possible, the authority on which their claims are based. When we are informed from what may be considered reliable sources, that a single concern in a neighboring city manufactures "40,000 pounds daily," and that there are numerous other large establishments of the kind scattered all over the country, it will be seen how important the subject is becoming as a question of health or disease to the entire community.

The most noted champion of the article, Prof. Mott, of New York, chemist to the "Commercial (Oleomargarine) Manufacturing Company" of that city, quoting from a French authority, whom he pronounces (as indeed he does all on one side of the question) as of the very highest, says that it (oleomargarine) is possessed of properties which allow of its close comparison, in a chemical point of view, as well as regards its uses, to genuine

butter, and it may take the place of the latter in many instances, and in consequence of the small expense at which it can be made it has been put in competition with milk butter, which will lower, necessarily, the price of the latter, to the benefit of the consumer."

2. It has been introduced into the East to so great an extent "that the great mass of butter made by the old dairy system was forced out of the market at a heavy loss to the producer (the farmer) and the commission merchant who made his advances."

3. Further, Prof. Mott says: "Mr. Michells, of this city, who is perfectly incompetent to make a microscopical examination, or too dishonest to make a fair one, nevertheless did make one, and also published it, and therefore I (Prof. Mott) visited Prof. J. W. S. Arnold, Professor of Histology and Microscopy in the University Medical College of this city, who is acknowledged to be one of the leading microscopists of this country, and engaged him to make an examination." The samples examined by Prof. Arnold were obtained from the Commercial Manufacturing Company by the chemist (Prof. M.) himself in person, and given to him. Rancid butter was also taken at the same time to the professor for examination.

4. Prof. Arnold reports: "I find the oleomargarine butter to consist of exceedingly clear and beautiful oil globules, a sufficient proof of its purity."

"The specimen of rancid butter shows very nicely the granular and irregular oil globules characteristic of decomposing fat. I send you a series of photo-micrographs of the various fats and butter examined. The magnifying power equals a four-tenths objective and 'A' eye-piece."

5. "Fig. 7, one of these micro-photographs," says the Professor, "represents a sample of rancid butter. It will be seen on examining this figure that dark black indentations are to be seen in most of the globules, showing that decomposition is in progress. This decomposition is the first stage of putrefaction," etc.

6. Prof. A. E. Verrill, A. M. S. B., of Yale College, says: "In regard to worms in beef fat, I will state definitely that no such instances are known to occur; nor have trichinæ been observed, either in the fat or flesh, except where the embryos have been purposely fed to the animals before killing them for experimental purposes."

7. Prof. Wm. H. Brewer, of Yale College, says: "The idea that oleomargarine is more dangerous than butter because heated

to only 120 degrees Fahrenheit, is simply nonsense." Question: "Do parasites that could find their way into the human system through the use of oleomargarine as food infest the bovine race?"

Ans.: "If such exist, science has not yet found them; no species has yet been described which would be transmitted to man in that way."

Question: "Is not oleomargarine, as made by the Mege patent, as wholesome and nutritious as cream butter?"

Ans.: "So far as chemistry and common sense suggest, I will not believe the contrary, unless its actual use demonstrates the fact."

8. Prof. Mott again says: "Fig. 7 (one of the micro-photographs of Prof. Arnold made at a magnifying power of 100 or 120 diameters) represents a sample of rancid butter. It will be seen on examining this figure that dark black indentations are to be seen in most of the globules, showing that decomposition is in progress. This decomposition is the first stage of putrefaction." This butter which is decomposed, and afterward putrefied, according to Prof. Mott; "when taken internally brings about a general disorder of the system, producing (characterized by?) violent cramping and purging, and often setting up putrefaction in the tissues. There can be no doubt that a very large per cent. of the sickness among the poorer classes is due to the use of rancid butter."

9. Prof. G. F. Barker, of the University of Pennsylvania says: "In theory, the process should yield a product resembling butter in all essential respects, having identically the same fatty constituents;" therefore, from the "physiological standpoint," etc., it should be "an equivalent for ordinary butter."

10. From Prof. Henry Morton, Stephens Institute, Hoboken, N. J.: "It (oleomargarine) contains nothing whatever that is injurious as an article of diet * * but is essentially identical with the best fresh butter."

11. From Prof. Henry Johnson, of Yale College: "Oleomargarine, in chemical composition, differs not in the nature, but only in the proportions of its components.

12. From Prof. S. C. Caldwell, of Cornell University: "Oleomargarine, when properly made, is a perfectly wholesome article of food. * * * It contains all the essential ingredients of butter."

13. From Prof. Goessman, of Amherst College, Mass.: "Oleomargarine, as made by the Commercial Manufacturing Company, is a wholesome article of food."

14. From Chas. P. Williams, Ph. D.: "Oleomargarine, as made by the Mege Patent, is a pure and wholesome article of food."

15. From Prof. Mott, Chemist to the Commercial Manufacturing Company: "I am clearly of the opinion that the product called oleomargarine butter is essentially identical with butter made from cream."

16. From Prof. J. W. S. Arnold, A. M., M. D., University of New York: "Oleomargarine butter differs in no essential manner from butter made from cream."

17. From Prof. W. O. Atwater, Wesleyan University, Middleton, Conn.: "Butterine is perfectly healthful and wholesome, and has a high nutritious value."

It may be proper to remark here that these certificates, beginning at No. 9 and ending here, are appended to an advertisement of the Commercial Manufacturing Company, received with the *Scientific American* of April 29, 1880. I do not mean to convey the idea that on this account, or from the fact that they may be paid opinions, that they are not given in good faith and with perfect honesty. I object to them as I do to all the other like statements thus far set forth in this article, that they are totally incompetent as testimony, even that low order of testimony sometimes admitted in the courts, which I have denominated in a recent legal paper, the "testimony of opinion."

Could there be anything more absurd for illustration than to call upon a chemist to give testimony as an expert in insanity, or as to the cause of disease, as Prof. Mott has done, as quoted above. And could there be anything more ridiculous or absurd than this statement of the Professor that "a large percentage of disease among the poorer classes is caused by rancid butter, and, still worse, this same butter often sets up putrefaction among the tissues" of the human body.

Of course this statement is nothing but guess-work on the part of the chemical professor. One would appeal in vain to the entire medical profession for a case of the kind, from any cause whatever, which, in the language of the professor, is characterized by the setting up of putrefaction among the tissues. In order that the public for which this paper is written may judge of the value of the testimony in the case, we must to some extent investigate as to the qualifications of the witnesses.

Thus, Prof. Mott again: "The dark black indentations seen in the globules show that decomposition is in progress. This decomposition is the first stage of putrefaction." Now "putrefac-

tion (according to the authorities) is the change of organic substances into new and less complex compounds;" while decomposition is "the resolution of a substance into its original elements." Thus, one of the less complex compounds produced by putrefaction, for example, sulphurated hydrogen, is by decomposition resolved into its original elements, sulphur and hydrogen gas. Further, the oil globules which show these "black indentations" were photographed on the wooden block, and engraved as such. Now, every person who knows anything about photographing knows also that all yellow, orange, and bright red-colored objects photograph black ("dark black," in the language of the professor), hence all such spots in a photograph of the kind would indicate

Fig. 1. (Pure Butter, Magnified 564 Diameters, or 318,096 areas or times.)

"decomposition the first stage of putrefaction." As if in making a photograph of deep orange-colored butter globules and of bright red arterial blood corpuscles, on finding that they appear black on the plate, I should declare that this showed "decomposition," etc."

My readers will fully understand that I am now examining (before them as the jury) into the qualifications of expert witnesses called upon to testify upon a subject of vital importance to the health and welfare of the whole community. On the one hand are manufacturing companies putting on the market vast quanti-

ties of a substance which they claim is wholesome food, and which claim they seek to sustain by these witnesses, while on the other is the public, whose health and comfort is greatly involved in the issue. Does the "expert" whom we have thus far examined show the least claim, either by his methods or by his knowledge of the very methods he makes use of, that his testimony is entitled to any kind of credit?

The nine professors, with the exception of Prof. Arnold, who have signed the certificates alluded to are all chemists, and their statements in the case may be generalized as follows, in the language of Prof. Brewer, of Yale: "So far as chemistry and common sense suggest, I will not believe that oleomargarine made by the Mege patent is not as wholesome and nutritious as cream butter, unless its actual use demonstrates the fact." That is, Prof. B. infers, through the evidence of chemistry and common sense, that an artificial compound, which he has never tested by experience, is a good and wholesome food. And Prof. Barker says "it has identically the same fatty constituents, therefore, from the physiological standpoint, it should be an equivalent for ordinary butter;" that is, it should have the same effect when taken into the human system. And Prof. Johnson, of Yale, says: "In chemical composition it differs not in the nature, but only in the proportion of its components." Now what of these chemical experts? They each and all of them know that there are many substances which are chemically precisely alike, which in their effects upon the human system are directly opposite to each other, one being wholesome, or comparatively innocent, while the other shall act as a deadly poison. For illustration, the oils of lemon, orange, tolu and savin, etc., are precisely the same chemically, *i. e.*, carbon 10 parts, hydrogen 16 (C. 10, H. 16), but while the first three are comparatively harmless substances, the fourth, the oil of savin, is an active poison. The works on medical jurisprudence give numerous cases of poisoning from this substance, *e. g.* Woodman & Tidy, page 271; case 2; female, age 21. Symptoms: "After a few hours had violent pain and sickness, and then became insensible. After a time sterterous breathing came on, with foaming at the mouth and convulsions. Four hours after she gave a low moan and died." Now suppose these chemists, upon being called upon to decide upon this oil, having been accustomed to know of the free use of the other oils mentioned, should declare

Fig. 2. (Same as Fig. 1, magnified only 141 diameters

it " pure and wholesome," what should we say of them? And yet this is precisely what they have done. Artificial butter, they say, is chemically and microscopically nearly, if not quite, the same as natural butter, therefore it is pure and wholesome. Oil of savin is chemically and microscopically precisely the same as oils of orange and tolu, therefore it is as wholesome as these oils.

One other of these astute chemists, Prof. Johnson, of Yale, says " artificial butter differs from natural butter only in the proportion of its constituents, therefore it is wholesome," etc. Strychnine differs only in the proportion of its elements from gluten, which, with starch, is one of the principal substances which go to make up wheat flour, and, of course, the bread we eat, both substances being made up of carbon, hydrogen, nitro-

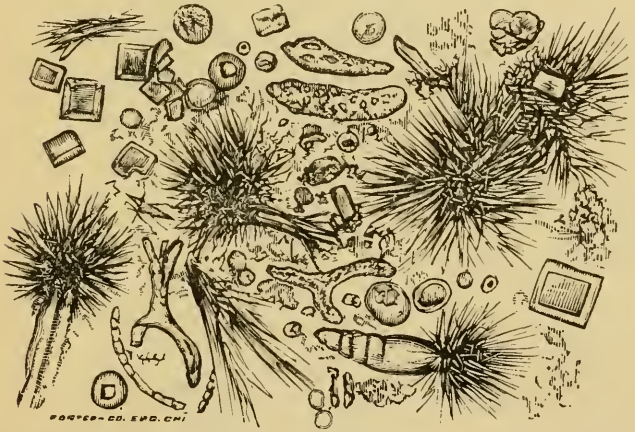

Fig. 3. (Magnified 564 diamaters, 318,096 areas or times. This is from a specimen of Oleomargarine, bought of a regular dealer aud sold under its true name. Here are seen fat and salt crystals, pieces of animal tissue, and various suspicious forms.)

gen and oxygen, thus: gluten (C. 29, H. 40, N. 6, O. 7). strychnine (C. 23, H. 22, N. 2, O. 2.) Here are the same elements, only they exist in varying proportions. What shall we say of this witness in court? He says: " I have analyzed gluten, of which our bread is partly composed. We all know this is wholesome; and I have also analyzed this substance strychnine, with which the prisoner at the bar has been charged with committing the foul crime of murder. He certainly can not be guilty, as this substance is chemically precisely the same as the wholesome gluten of which

bread is made, as aforesaid, and only differs in the proportion of its elements." And here is precisely the position in which all these professors place themselves. They have in no case followed out the effect of this new article of food upon the living system of man or any of the lower animals. They are none of them physicians (I do not except the one M. D. of their number), and have not the least claim to give a guess even of the effects of raw, uncooked and so manipulated animal fat upon the human body when taken into the stomach. French authorities state that the flesh of over-driven animals, when applied raw to the skin, has been known to produce dangerous diseases, and that its reception into the human stomach has in several instances proved fatal. The writer has known one instance in which a strong, healthy young man met his death in less than twenty-four hours from this very cause. Who shall say that the Commercial Manufacturing Company, with all their care and watchfulness, may not, in the hurry of their great business, work up the fat of some such animals into oleomargarine butter? But this part of my subject further on. The point I wish to exhibit here is the total incompetency of these witnesses. They base their testimony wholly upon chemical and microscopical analogies. They can not be so ignorant as not to be aware of the utter fallacy of such a method of proof, especially as it regards the action of any substance on the living animal economy.

I will illustrate still further. There are two kinds of phosphorus, which are so nearly alike as to pass into each other by the action of heat. One variety is a fearful poison. The works on the subject record hundreds of instances of death from this variety. Out of thirty-two cases recorded by Woodman & Tidy, only two recoveries are mentioned. The vapor of the substance is also very poisonous. This result manifests itself in those persons who work in match factories. These authors mention fifty-four cases in which the teeth and bones of the jaws were diseased. They say: "The general system usually suffers severely, and unless the bone exfoliates, or is removed by operation, death is almost certain. * * * The evil may be entirely remedied by the use of the red phosphorus, instead of the yellow variety, in match-making." The reason for its non-use in this manufacture is the fact that it is not so sensitive to friction as the other variety. "Ordinary phosphorous is very poisonous," says Bloxam, "while amorphous phosphorus (another name for the red variety) appears to be harmless." Now suppose, for illustration, the red

variety had been first discovered, and had passed into use, as now, for matches, etc. No children would have been killed by sucking these matches, as is now frequently the case; no work-

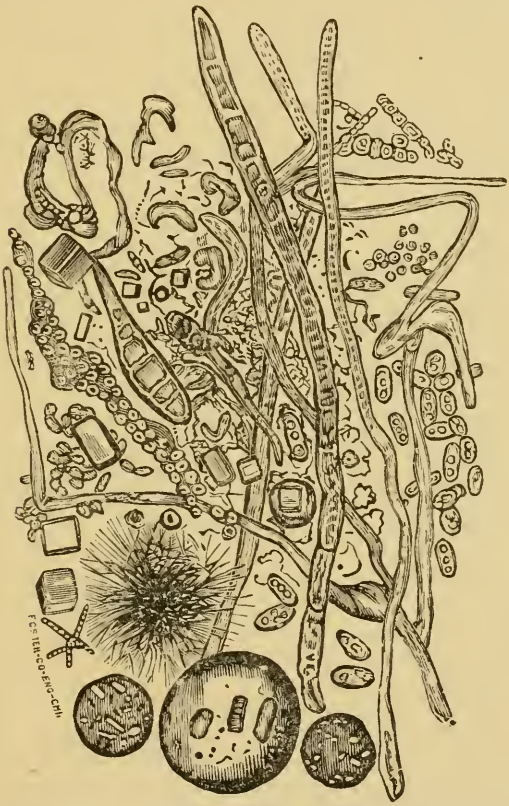

Fig. 4. (Magnified 564 diameters. This specimen was obtained at a respectable eating-house in Chicago. The cut is made up of drawings from several successive examinations. When placed upon the slide in the first place, shreds of animal tissue, salt and fat crystals, and spores were seen, and also a peculiar form which I have frequently met with in foul water. The other objects, many of which were active, living forms, together with the fungi, were obtained after the stuff had been boiled in distilled water in a test tube and allowed to stand over night. On cooling, the top of the fluid was covered with a coating of grease. Through this cover, which of course was impervious to outward floating organisms, the pipette was thrust and the specimen thus obtained. Many of these forms are such as are present in all putrefying animal matter, while others are, perhaps, the bacteria of special diseases, or morbid changes in the animal tissue.)

men would have been poisoned in their manufacture. Now comes the yellow variety, and it is submitted to our chemists for examination. They all find it to be chemically the same as the first. In scientific language, they pronounce it to be isomeric with it, and Prof. Brewer, as spokesman, on being asked whether it is poisonous or not; replies so far as chemistry and common sense suggest: "I will not believe that it is not as innocent as the other." Or, in the language of Chas. P. Williams, Ph. D., oleomargarine, "in its chemical composition, is fully the equivalent of the best quality of dairy butter." He precedes this with "From my knowledge of its composition I am satisfied that it is a pure and wholesome article of food." It is but fair to state that all these certificates are based upon the examination of specimens of the stuff obtained from a single company—the Commercial Manufacturing Company, of New York city. Now, as I have said before, these experts could have no standing in any court of justice. Their so-called opinions are worse than guesses, as they are based on analogies which would not justify conclusions; only theories as to the action of inorganic bodies upon each other, much less of the action of any class of bodies upon the living animal system.

Prof. Brewer, of Yale, I have quoted as saying: "The idea that oleomargarine is more dangerous than butter, because heated to only 120 degrees Fahrenheit, is simply nonsense." This means that raw animal fat, no matter what organisms it may chance to contain, is as wholesome as butter. A physician in this city informs the writer that he has had four cases of tape-worm recently produced from eating raw beef. Dr. Cobold says that this species of tape-worm is as common in England as the tænia solium, the one produced by eating raw pork. But it will be said that the cysticercus from which this worm is produced is not found in the fat of the ox. This is by no means proven. The larvæ of one species is found in the fat of the swine; why not in the fat of the ox? Admit this statement to be true, however, still the fat is in very near proximity to the lean, and some of these larvæ might be dislodged from their cells in the process of separating the two kinds of flesh, and thus get mixed with the fat; or a portion of the lean might be so dislodged, and carry with it some of these cysticerci. I have in my possession at the present time slides of oleomargarine on which specimens of lean meat may be seen sufficient, if the proportion in which they were found should continue through the entire package, to populate a nation. These specimens are from a firkin of this artificial butter sent to the editors of the *Western Rural*, of this city, and by them furnished to me.

Suppose, again, some of the wormlike bodies found in cattle plague, which Beal tells us are sometimes met with in small numbers in animals which are perfectly healthy, should chance to get into this raw-meat butter. These, he says, are sometimes found free, so that there would be no mechanical difficulty in the way of their migration. Another small, worm-like body is described by Parke (Manual of Hygiene, p. 212), which is found in the sheath of the muscles, from which it of course would be dislodged in the process of dressing the animal. He says they "are produced in enormous quantities in the flesh of domestic animals—oxen, sheep and pigs. They have been known to produce sudden death in sheep, and paralysis in the hind legs of hogs."

He adds: "It is by no means improbable that some effect on man may be hereafter discovered to be produced" by these so-called psorospermia.

Woodman & Tidy (Forensic Medicine, p. 573) give an account of the echinococus which is found in the sheep and the ox, from whence it is conveyed to the human system. Dr. Leared says that one out of every five deaths among the people of Iceland is caused by it. In the ox it is found in the peritoneal cavity, the very region from whence the Commercial Manufacturing Company claim that they get the animal fat from which they make their precious compound, which, according to Prof. Arnold, A. M., M. D., "is a blessing to the poor," and is even better than natural butter in one respect, that is, in keeping qualities.

The authors just quoted say good cooking is the only safeguard against this and other like so-called worms which infest animals used for food. They add emphatically, "Raw meat should never be eaten." Prof. Brewer, of Yale, and all the other learned chemists quoted, declare in effect that this is "simply nonsense." Raw-meat butter "is as pure, as good, as nutritious, as excellent, as desirable, as satisfactory, as attractive, as wholesome, as sweet, as cream butter. It is a grand discovery, so grand that the ordinary mind can not grasp and understand it;" and, finally, "it is a great blessing to the poor."

Mr. Michells, of New York, who has shown by his published writings on the subject full competency as a scientific man to deal with it, says that after a long series of examinations he has come to the conclusion that oleomargarine made after the Mege patent is not a safe article of food—it is nothing but raw fat liquified, scented, colored and flavored to give it a spurious appearance of butter—and that those that use it run the risk of trichinæ from the

stomachs of pigs chopped up with the fat, and that infection from certain contagious diseases which are common to man and the domestic animals might follow Further, he says the temperature (120 degrees Fahrenheit) to which the substance is exposed in the process of manufacture is totally insufficient to kill the embryos of parasites or destroy the germs of disease which exist in a very large proportion of domestic animals used for food. And that he has found portions of tissue and muscle in oleomargarine, and that others (Mr. Saylor) have positively identified germs of disease in that substance. Mr. Michells is fully sustained in his opinion by the Rev. W. H. Dallinger, the English naturalist, who is certainly the greatest living authority upon the subject, who, in a letter to Mr. Michells, says the germs of the whole septic series of organisms require a temperature of at least 212 to 235 degrees Fahrenheit for their destruction in fluid. "Quite as serious a matter is that of the introduction into the human intestinal track, through the means of oleomargarine, of eggs of entozoa."

In closing his letter, he says; "This is an important matter, and although likely to be in practice neglected at first by the public, may probably impress itself upon them in an unwelcome manner in the future."

Rev. E. Huber, the Richmond, Va.. microscopist, says, in the *Southern Clinic* for May 1880, oleomargarine differs in its microscopical appearance, as well as in its nutritive and dietetic qualities, from natural butter. * * * "The fat is not subjected to a heat sufficient to destroy the germs of septic and putrefactive organisms. * * * There may be also introduced into the system by its means the echinococci, which develope in tape-worms."

If we go over some of the certificates of the chemical professors, it will be seen that they seem purposely so worded as to convey a false idea. Thus, Prof. Brewer: "Science has not found in the bovine race parasites which could get into the human system through oleomargarine." Further, "This substance, as made by the Mege patent, is as wholesome as cream butter." To repeat, we must keep in view all the time that raw fat is as "wholesome as cream butter." Suppose it should chance to be so that no "worm," etc., is to be found in beef fat, and therefore they could not "get into the human system through oleomargarine," of what consequence is all this, provided the same purpose is accomplished through the process of manufacture. By the Mege patent, as we have seen, the stomachs of pigs and sheep are used, chopped up with the beef fat. Could not the trichinæ get into the false

butter through this process, and hence into the human system? Mr. Michells tells us it could. Woodman & Tidy (p. 462) say that the ova of the "worm" lies in the stomach of the pig or other animal from six to eight days before they are completely developed, while three or four more are consumed, when "each female will

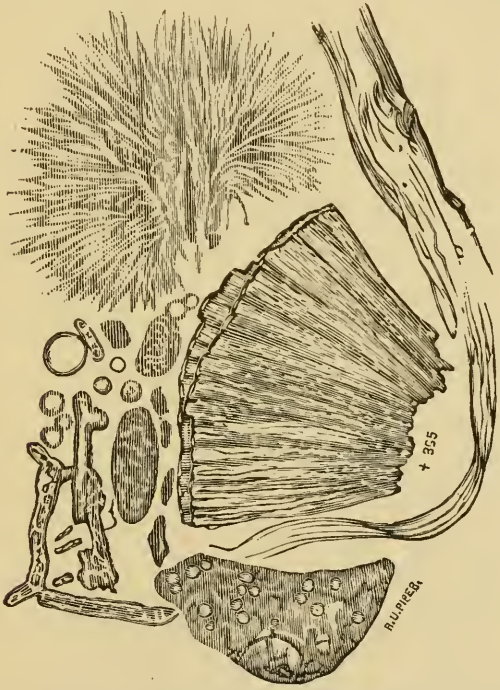

Fig. 5. (Magnified 358 diameters, 126,025 times, is from a specimen of oleomargarine, furnished as I have said by the Commercial Manufacturing Company; the one so certified to as making a perfectly pure and wholesome article. A few bacteria, and fungi, may be seen in the specimen. The mass on the left looked like a bunch of orange-colored jelly. The next broad mass is muscular fibre. It was red in color, and would have photographed black, as would also the jelly like substance. There is, in addition, a mass of fat crystals, as also pieces of cotton fibre. I have found many pieces of muscular fibre in the various specimens of oleomargarine I have examined.)

give life to over one hundred young ones." The worms then begin to bore their way through the walls of the stomach into the muscles. It is certainly not unreasonable to suppose that during the ten or twelve days of time that the germs, etc., require in

order to be developed, that some of the animals might be brought to the shambles, and that one of these so populated stomachs might get chopped up with the fat, and even if they were carefully washed and cleaned before using, still thousands of the little creatures might remain in the walls of the organ. It will be remembered that these parasites, in all their stages of development, are wonderfully tenacious of life. The authorities tell us that "they are not destroyed by salt, by smoke, or, indeed, by putrefaction. Thorough cooking, however, kills them, and for this reason all meat for the table should be well done."

But this exposition of our liability to diseases from eating raw grease of one description does not by any means give a full idea of the danger to which the public are exposed from the use of the article which I have been discussing.

Mr. Michells tells us that "there can be no doubt that fats and grease of every description are used to make oleomargarine, because all the caul-fat of oxen brought to New York city in a week would not be sufficient for one factory for four days, and there are seven oleomargarine factories in the city." Rev. E. Huber, whom we have quoted before, says that the gentleman in Richmond who had the first agency for the sale of the article has found it so bad of late that "he has given it up in disgust;" and a paper in New York has published a cartoon showing persons in the act of collecting dead dogs and horses from the streets for the use of the oleomargarine factories, while "Prof. Mud" is giving a certificate in the following words:

"I have examined your articles with a powerful microscope, and can find nothing deletereous in them."

PROF. MUD, Analytical Chemist.

It will be remembered by my readers that the microscope is an instrument which, like magnifying spectacles, enables us to see objects which are invisible to the unaided eye. The power is reckoned by diameters, that is we see the surface of an object under the instrument just as many times long and broad as it is magnified in diameters. Therefore the number of diameters in a given case multiplied into itself gives the area or number of times the surface of the object is increased in size. Thus an object which is one-tenth of an inch square, on being magnified ten diameters would appear one hundred times as large as it really is, or would cover a space one inch square. For this reason many of the objects which are clearly shown in my drawings would not be seen at all if only magnified as high as Prof. Arnold's micro-photo-

graphs (on which Prof. Mott has based all his statements as it regards the testimony of the microscope in the subject under discussion). None of the spores or bacteria would be brought into view at all, and "Prof. Mud" might well give his certificate as above.

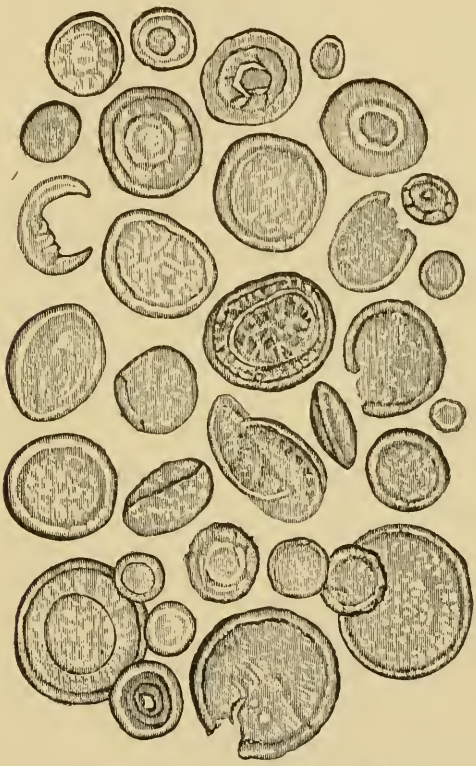

Fig. 6. (Is also from a specimen of the Commercial Manufacturing Company's production. The nine forms at the bottom of the picture are from cases of tape worm occurring in the practice of physicians in this city. The others, as I have said, are from oleomargarine as above.)

This is a most important matter for the public to fully understand, as through the agency of this man, Prof. Mott, nearly all the literature favorable to this fraudulent manufacture has been produced, and all the so-called scientific data on which it is based

might fairly be judged of, from his published statements and his application of the microscopic investigations in the case.

"Falsus in unam falsus in omnibus."

Prof. Arnold says "the magnifying power (used in making the micro-photographs to which we refer) equals a four-tenths objective and 'A' eye-piece." The Messrs. Beck, the microscope manufacturers, set down the magnifying power of a four-tenths objective and "A" eye-piece as equal to 120 diameters, with the highest angle of aperture 146 diameters; Messrs. Powell and Leland 125 diameters. Thus it will be seen that all the conclusions based upon such data are entirely deceptive, and seem, to say the least, to be based upon fraud. Are not these men aware, one a professor of physiology and histology in a great public institution, that this power would not suffice to show hundreds of objects a higher power would reveal; much less would this low power enable one to settle any one of the facts they claim to settle by its means. The whole of Fig. 6, if compressed to 150 diameters, would not occupy the space of a square drawn round the group of four forms which touch one another on the left-hand lower corner of the figure. Reduce the other figures in the same proportion, and the largest of them will be crowded into a space of one inch by seven-tenths, and of course all the smaller objects would entirely disappear. Now let us think of these plates once reduced, or rather of the whole microscopic field under no higher power than this, and a professor of physiology and histology deciding upon a question of vital importance to the health and welfare of the people upon such slight grounds.

Mr. Michells says, in closing his article upon the subject, that he was told by the editor in chief of the New York *Times*, in which the last paper I have quoted from appeared, that this paper to which Dr. Mott had signed his name, and which contained the names of Profs. Arnold, Brewer, Verrill, et al., was nothing but an advertisement, and that quite a large sum of money was paid for its insertion, in fact, thousands of dollars, and that therefore no reply would be permitted to him.

I close by quoting from a former article of mine published in the *Western Rural:*

The saddest thing in all this, however, is not, in the words of Mr. Michells, that "honored names and great public institutions can thus be used to advertise a grease factory," for this might at least be an innocent business, but that men occupying positions at the head of such institutions could be hired, or in any other way

be induced, to lend their names to help palm off a fraud upon the community. Even if the article is sold under its true name, still it is a fraud, in the fact that it is made to resemble butter, when it is nothing but raw fat, with the worms, eggs, etc., which may have originally belonged to it, together with those which may chance to get into it in the process of manufacture, and also the substances with which it is colored and flavored. One other fact ought to be mentioned here—the fat which is used in a given case may chance to come from animals which are diseased, and the stomach, also, may be in a like condition. Now, if used as butter, the stuff would go into the human stomach in most instances in a raw state, and might, under this condition, be very dangerous, which danger would probably be obviated in most cases by cooking. Trichinous meat, as is well known, is thus rendered harmless.

Are the eggs as shown in Fig. 6, the eggs of the tape-worm? And if not, what are they? I have several slides of these eggs.

Could they not have very easily got into the oleomargarine by way of the pigs' stomachs? These eggs, Prof. Benedin tells us, "are surrounded by membranes and shells," which are digested after a certain time in the stomach of the pig, and the eggs set at liberty." These next lose their shells by the action of the gastric juice, and the embryos now begin their work of boring into the walls of the stomach. Surely here is ample time, while all this process is going on, for the pig to get killed and the stomach to be worked up or used in the process of making the fraudulent butter. What then? The egg got into the human stomach through the oleomargarine, or in any other manner, does not become a tape-worm, but developes into a far more dangerous form of worm, called cysticerci. Benedin says an egg of the tape-worm (tænia solium) sometimes gets into the human stomach, where it is hatched precisely in the same manner as in the stomach of the pig. It finds its way into some enclosed cavity. "Some have been found in the eye-ball, in the lobes of the brain, in the heart, or in the muscles." He mentions the case of a man whose death was caused by these "wandering worms." At the post mortem cysticerci were found to occupy a spot near the commissure of the optic nerves. "One of these was alive, the others calcified." Two others occupied a lobe of the brain.

It is said, with how much of truth I do not know, that cheese is being adulterated with this stuff—oleomargarine. If this be the fact, the public should be warned of the danger. Under the circumstances, I can, of course, merely direct attention to the state-

ment. And in this connection I would add that if it should chance to be true, as quite likely is the fact, that genuine butter, if bad in quality, is dangerous to health, that this is no ground for concluding that raw fat, scented and colored, etc., *i. e.*, oleomargarine, is " a pure and wholesome article of food."

At least, genuine butter, however bad, can not contain the eggs or larvæ of trichinæ or the tape-worm, etc., and can not by any process be produced out of the fat of diseased and putrefying animals

CHICAGO, June 12, 1880.

Since the above was put in type I have received specimens of eggs of some sort found in oleomargarine and kindly sent me by the Rev. E. Huber, of Richmond, Va., quoted before. Mr. Huber has frequently found these eggs in specimens of the fraudulent

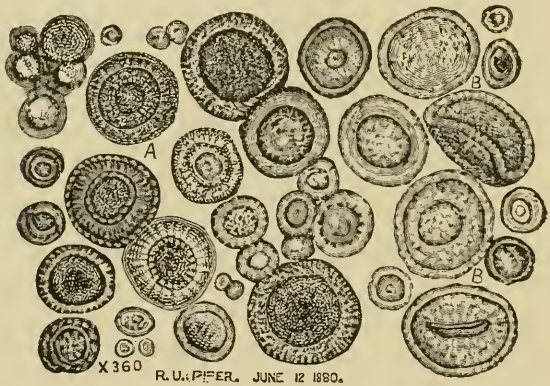

Fig. 7. (A. From oleomargarine. B B. Nine tape worm eggs.)

butter. They resemble those in my plate so closely that at least they must be a very nearly allied species. Thus it will be seen that these eggs are by no means accidental findings, but that they exist by thousands in the precious stuff. We are told by some of our eminent chemists that " oleomargarine butter is a great blessing to the poor." Certainly not, we should think, if their stomachs are to become by this means the receptacle of these eggs, which are destined to hatch into worms, whose final business is, as we are informed, to take up their residence in the heart, brain, etc., of the blessed recipient. R. U. PIPER, M. D.

CHAPTER II.

MILK, BUTTER AND CHEESE.

The substance which modern ingenuity has devised as a substitute for butter having been fully discussed in the preceding chapter, we will proceed to the brief consideration of the article of butter itself. Before doing this, however, it is proper that we should first give attention to the fluid from which butter is produced, and which, besides its use in the production of both butter and cheese, is a staple article of diet, and particularly of the diet of the young.

The milk supply of larger cities is a subject which has received much attention in our own country, as well as in Europe, and the most constant watchfulness on the part of the municipal health officer has been found necessary to prevent its reduction and impoverishment with water, as well as its contamination with foreign substances. In spite of this vigilance there can be no doubt that much of the milk supplied to the city consumer is not only fraudulent, but unfit for food.

The investigation of this subject by the writer, though necessarily local, would no doubt have developed only similar results if extended to any number of the larger cities of the country.

We will first consider the adulterations practiced simply in the light of a fraud. Numerous estimates have been made of the average daily consumption of milk *per capita* in various sections of the country. It is entirely safe to say that every 100,000 inhabitants of large cities consume at least 17,000 quarts of milk per day. Dr. Wight, the really accomplished and efficient Health Commissioner of Milwaukee, places the daily consumption in that city, which has a population of a little more than 100,000, at 17,014 quarts. Putting the average price at 5 cents per quart, it will be

seen, then, that the milk supply of Milwaukee, for instance, costs about $850 per day, or $310,505 per year. Now, suppose that the adulteration or watering of this milk amounts to only 10 per cent. (and we have found it carried as high even as 30 per cent.), and the fraud perpetrated upon the milk consumers of Milwaukee would aggregate over $31,000 yearly.

But this loss in dollars and cents is nothing when we consider the loss of health that may result from the adulteration or con-

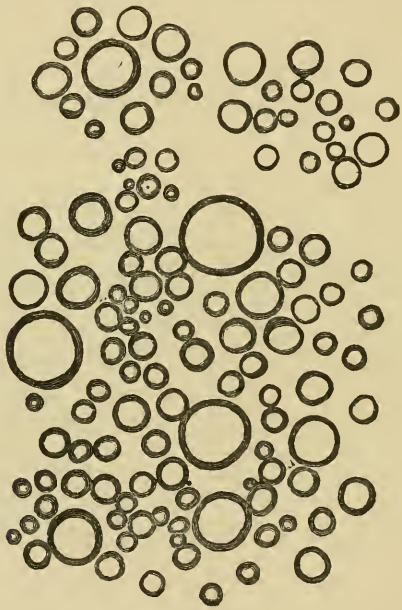

Fig. 1.

tamination of an article so generally and largely consumed. Dr. Wight, whose figures we have seen fit to adopt, very truthfully observes: "If any considerable portion of the milk thus sold should be rendered unwholesome by filthy stables, unhealthy cows, uncleanly surroundings, etc., none but Heaven could measure the sickness and suffering, or record the deaths thereby caused among children in the various households of the city. Against such considerations no fictitious 'personal liberty' to be nasty, no spurious 'freedom of trade' to supply the people with adulterated and polluted food, can stand a moment."

In considering the purity and wholesomeness of milk it is primarily important that we should take cognizance of the stables in which the cattle are housed, the character of the food supplied to them, as well as the hands and the atmospheres through which it passes on its way from the dairymen to the consumer. A writer in the *British Medical Journal* observes: "Now that milk has been so repeatedly and abundantly proved to be a source of epidemic disease, by reason of its imbibition of poisonous gases or contamination by polluted water, or at the hands of infected persons in dwelling-houses or rooms connected with dairies, it would be very satisfactory to know that stringent use was being made of recent enactments aiming at the separation of dairies from dwelling-houses, and the enforcement of precautions necessary for

Fig. 2.

ensuring the safeguarding of this necessary of life on its way from the cow to the kitchen. This desideratum, however, appears to be still far from general realization. Mr. Corner gives, in his last report, two striking examples of what may occur for want of due sanitary inspection of dairies. In one case, the milk was stored and retailed in a yard where it was exposed to offensive gases; in another, the body of a child who had died from scarlet fever was found in the house of a dairyman, neither coffined nor disinfected, and the mother had attended both on the child and on her customers during the several days of her child's illness. Under an

adequate system of inspection, whether private or public, such dangers would be prevented."

Dr. George Wilson, a distinguished sanitary writer, says: "The greatest danger attaching to milk, as a carrier of disease, depends upon its remarkable powers of absorption and the rapid fermentive or zymotic changes it undergoes when it becomes mixed with putrefying matter, or tainted with disease germs. There is now an overwhelming amount of evidence which proves, beyond dispute, that milk is largely instrumental in propagating scarletina and enteric fever."

After quoting from the above authority, Dr. Wight, in his last annual report, writes: "The very essence of dung, saturating the atmosphere of stinking stables, the poisonous vapors of organic decay, the floating contagia of scarlet fever, diphtheria, small-pox and other infectious diseases, are all rapidly absorbed by milk, as a sponge takes up water, and may be conveyed to the mouths of innocent children or unsuspecting adults. When cows become unhealthy by being confined for several months in close, dark, unventilated stables, their milk undergoes vital changes, which chemistry can not detect, which the microscope does not reveal, which the senses fail to discover, making it unwholesome. No person should be allowed by public authority to sell to the people an article of diet so delicate as milk, of such universal use, except under conditions that shall reasonably guarantee its cleanliness and its freedom from every form of poison."

The feeding of cattle upon the refuse or slops from distilleries and breweries is a subject which has received frequent attention in the daily press, as well as in the illustrated publications of the country. It is only necessary that we should refer to the practice to condemn it. The effect of this unnatural feeding, both upon the milk drawn from cows and upon the flesh of cattle killed for food, is striking and unmistakable. While chemical tests have failed to detect any difference in the milk of the swill-fed cow and the cow which selects its natural food in the pasture, the microscope does not thus fail. Dr. Piper, who, in conducting a recent investigation of the milk supply of Chicago, made over five hundred microscopic examinations, says: "With the microscope we can distinguish with absolute certainty between milk produced from normal food and that from the whisky-poisoned leavings of the distillery and the brewery." We give two drawings which sufficiently illustrate this fact. In Fig. 1, which represents a pure, undiseased and clean milk, the corpuscles will be found circular in form and regu-

lar in outline, while in Fig. 2, drawn from a specimen of swill-milk, quite the reverse will be found to be the case.

How much the lack of proper exercise and the requisite amount of pure air may have to do with diseasing the flesh and contaminating the milk of cattle crowded together in the contracted and unventilated distillery sheds it is difficult to determine. That it contributes to this result in no small degree there can hardly be a doubt. Mærcker, a distinguished German authority, gives 1,059, 1,412 and 1,765 cubic feet of air per hour as necessary for cattle of different sizes; and Dr. Parkes says: "In cow-houses disease and health are in the direct proportion of foul and pure air." In the cattle sheds of only one distillery (the extensive distillery of Henry H. Shufeldt & Co.), out of the large number visited by the writer in and about Chicago, was there manifest any regard whatever for ventilation.

But leaving the surroundings of milk-giving cattle and the food supplied them entirely out of the question, and presuming that the milk as it leaves the cow is quite pure and wholesome, and yet we have no guarantee that it will reach us through the ordinary channels of supply in its pure and natural state. Out of several hundred samples examined by us during the preparation of this work we have found but very few, almost too few to mention, which had not been in some manner tampered with. The most common methods of defrauding the consumer are by removing the cream, adding water and mixing old and new milk together.

Dr. Hassall mentions having found even as high as 50 per cent. of water added to London milk. We have found as much as 30 per cent., and very frequently 20 and even 25 per cent.

The theft of the cream from milk is quite as common a practice as the addition of water. There is generally from two to three quarts of cream skimmed from each can of eight gallons.

The addition of water in large quantities has the effect of changing the appearance of milk, as well as reducing its flavor. Other adulterations are therefore resorted to to conceal the otherwise apparent fraud. Sugar is added to restore the lost sweetness, salt is often added to bring out the flavor, and coloring matter is necessarily added to restore the appearance. For coloring we have found annatto, turmeric, and occasionally other substances used. Chalk and starch are also common adulterants, and cerebral matter is likewise occasionally introduced, as well as gum and dextrin.

Carbonate of soda is freely used by milk dealers to prevent milk from souring—about a tablespoonful being added to each can. Milk which has already commenced to sour is also treated with sugar and carbonate of soda by which it is restored to a salable condition. When skimmed milk is mixed with fresh milk soda is almost always used.

Though water may at first thought seem the most harmless adulterant that can be added to milk, or to any article of food or drink, it should be borne in mind that water itself may be impure and unwholesome, and whatever impurities or disease germs it may contain are readily transferred to and retained in the milk.

We may illustrate the extent to which it is possible to carry the fabrication of milk by stating that Dr. T. D. Williams, envious, perhaps, of the necromantic skill of Chicago milkmen, recently prepared a compound which, though no element of it was derived from the cow, was so deceptive, both to the eye and the palate, as to be pronounced by a neighbor a rich and choice sample of lacteal fluid.

We have often found cream to be largely adulterated with gums.

In New York and St. Louis the sale of swill-milk is prohibited by law; in nearly every large city ordinances are in existence against the reduction and adulteration of milk, and it is a severe commentary upon our system of local government that in the face of these enactments a really pure and wholesome milk is an exception rather than the rule. A rigid national law, strictly and honestly enforced by competent health officials, might reach the root of the evil.

Much that we have observed with reference to the effect of filthy and infected stables and dairies upon milk will apply also to butter. The hands that manipulate any article of food should at least be clean. That they are not always clean, nor yet free from disease, is the logical result of the total lack of inspection of the dairy, in common with every other source and surrounding of our food supply, as well as the methods and processes of its manufacture and preparation.

Besides its being frequently contaminated with filth, butter is sometimes grossly adulterated. The adulterants used are water, starch, curd, animal fat and coloring substances.

It has been demonstrated that even 50 per cent. of water can be incorporated with butter, though adulteration to this extent has probably never occurred. The introduction of water is effected

by bringing the butter to the melting point and stirring in water and salt until the mixture becomes cold.

The fat of beef, mutton, veal and lard are all more or less used in different sections of the country, the last-named being the most common, particularly as an adulterant of low grades of butter.

In our investigation we have discovered, among other coloring substances, burnt sugar, turmeric, annatto, the juice of carrots and saffron. As annatto is itself adulterated sometimes with red lead, its use is never safe.

The art of working over, deodorizing and rendering palatable old and rancid butter has been thoroughly studied and quite extensively practiced. This rejuvenated product of the churn, however, has found, in the last few years, a formidable rival in oleomargarine.

The adulterations of cheese are very similar to those of butter, so far as coloring substances are concerned. Herbs are also added in some dairies to impart flavor. But the more fraudulent adulteration is with starch and flour, which are often added in considerable quantity, to give bulk and weight.

CHAPTER III.

FLOUR.

In its generic sense the term flour would apply to almost any ground seed or grain. Our purpose in the present chapter, however, is only to consider the meal or powder obtained by the grinding of wheat, oats, rye and corn, and more particularly the first-named grain. In fact, in using the general term flour, we wish to be understood as meaning wheat flour. Our allusions to other products of the mill will be made under their specific names, as rye flour, oatmeal, etc.

In considering the article of flour it is first necessary that we should recognize its distinct classification into what are known as spring-wheat flour and winter-wheat flour, and to point out the marked difference in the general characteristics of the two.

Spring-wheat flour is characterized by a preponderance of the glutinous over the starchy element, while, on the other hand, winter-wheat flour contains much more starch and much less gluten. These distinctions are also affected—rendered more or less marked—by the peculiarities of the seasons in which the grain is grown and harvested. Thus, what is known as a wet harvest is attended with a marked increase of gluten in the grain, while a dry harvest develops more starch. The preponderance of gluten in the grain has the effect of rendering the flour dark-colored. A very white flour is, on the other hand, always a starchy flour. Moisture likewise has the effect of turning flour dark, and either a damp or a damaged flour is always of a dark color.

It is quite necessary that we should understand the foregoing facts before we consider the processes and agents employed in the manipulating or "doctoring" of flour, so as to render a dark flour light, and even to conceal the character of flour that is damaged.

Though the flours containing the larger percentage of gluten are more valuable as food, the gluten being the nutritious element of the grain, the public too frequently consults the eye instead of the stomach, and allows itself to be guided by appearance, without regard to quality. Thus the flours which contain the least gluten and the most starch are preferred, for the simple reason that they produce the prettiest bread—the whitest loaf. And to gratify this foolish popular whim the miller exhausts his ingenuity to produce a white flour, while the baker frequently resorts to the use of absolutely poisonous adulterants to produce a white bread.

Another popular fallacy also exists in the idea that a starchy flour will make more bread. The writer himself has more than once heard it remarked by the housekeeper that "a good flour (meaning a white, starchy flour) goes further." Starch will take up and retain more moisture than gluten will, hence the reason why a starchy flour "goes further." More bread, it will be seen, simply signifies more water. This the bakers fully understand. The greater the amount of water that can be introduced and held in the loaf, the greater their profits.

We have taken considerable pains to ascertain the extent to which flour is adulterated by American millers, and the result of our investigations is highly gratifying, in that it shows the very rare use of harmful agents to change the character or improve the appearance of their products.

In England the adulteration of flour was at one time carried on to a very great extent. This was done by the introduction of the flours of cheaper grains, such as rice, rye, barley, and corn, as also the flour of the bean and potato. Alum and carbonate of soda were also used as mineral adulterants, and Dr. Hassall mentions, likewise, mineral white, or hydrated sulphate of lime, silicate of alumina, or China clay, bone ashes and bone dust, terra alba and chalk.

In our own country, where wheat is both abundant and cheap, where the harvest is unfailing, and where most of the flour is produced in mills located in the immediate vicinity of boundless grain fields, we are gratified to say that the adulteration of flour by the miller is of much less frequent occurrence. In only one sample out of a great number examined by us have we found alum, and in only three have we found terra alba, clay and ground peas.

In a very large number of samples of low-grade flour we have detected the presence of the meal or flour of corn, it generally being present to the extent of five per cent. This, we learn from

the millers, is added to the lower or darker grades, to render them whiter, an effect which it readily accomplishes.

While the public escapes poisoning at the hands of the miller, there are other hands through which the flour passes before it reaches the consumer, which are by no means so innocent of the crime. The mixers of flour and the baker require our attention, and the various agents employed by them to produce a white bread and an attractive cake will be duly considered in out next chapter.

An article of comparatively recent manufacture, known as "patent flour" is deserving of mention. It is a well-established fact that the hull of the wheat kernal contains some of the most valuable constituents of the grain. According to Dr. Hassall it contains a large amount of nitrogenous matter, including the very important principal, cerealin, as also much oily matter. What were generally sold as the finer grades of flour in the past were flours from which this hull or bran was entirely sifted. The improved or patent flour is characterized by having this most important and valuable element restored to it.

A number of samples of rye and buckwheat flours have been examined by us, in none of which have we found any foreign element, though we are not prepared to say that they are not sometimes adulterated. A friend in New York writes us that he has, with the aid of the microscope, discovered in both of these flours the presence of the flour of damaged peas.

Oatmeal, the nutritious value of which has long been recognized in Great Britain, has rapidly come into favor as an article of diet in our own country within the past few years. It is generally produced by crushing the grain, though an excellent article has been submitted to us which was cut by a patented process, and which was not only very clean, but quite free from the dust or flour of the grain. All the samples of this article examined by us were found to be entirely pure and made from sound and wholesome grain.

Prof. Forbes, of Edinburgh, during some twenty years, measured the breadth and height, and also tested the strength, of both the arms and loins of the students in the University, a very numerous class, and of various nationalities. He found that in height, breadth of shoulders, and strength of arms and loins, the Belgians were at the bottom of the list, a little above them the French, very much higher the English, and highest of all the Scotch and Scotch Irish from Ulster, who, like the natives of Scotland, are fed in

their early years with at least one meal a day of good oatmeal porridge.

The article known as self-raising flour requires our attention. Both a wheat and buckwheat self-raising flour are extensively sold, and both are liable to be manufactured from a low grade of flour, as well as to be contaminated with dangerous and unwholesome adulterants. Six samples of each have been examined by us, with the following result:

In three out of the six samples of self-raising wheat flour alum was found and the flour was of a very low grade.

In one sample a very low grade of flour was found, though no alum was present.

In two samples a high grade of flour was found, with acid phosphates and soda as raising agents—both entirely harmless.

In one sample of the buckwheat flour alum was found.

CHAPTER IV.

BREAD AND ITS INGREDIENTS.

A thorough investigation of the subject of flour and its uses would be impossible should we fail to consider most carefully the various agents employed to produce the fermentation in dough by which the proper and desirable lightness is given to the products of the oven. These agents are often supplied to the bread-maker by the chemists, and are more generally known as baking powders. Compressed or distillers' yeast is largely used in the cities, and a dry hop yeast is also extensively manufactured, and sold where the compressed yeast can not be procured fresh from the distillery. Both of these articles are, we believe, perfectly wholesome, analysis of the samples procured by us having shown the presence of no deleterious element or substance whatever. The use of either, however, is very limited, compared with the consumption of baking powders.

Though the Scriptures assert that "man does not live by bread alone," we have nevertheless come to regard it as veritably "the staff of life." It constitutes a part of every meal. It is the inseparable accompaniment of almost every variety of animal food. No vegetable, not even the potato, has succeeded in displacing it. It is peculiarly the staple article of the dietary of childhood. Whatever, then, enters into its composition can not be too carefully or conscientiously studied as to its purity and wholesomeness.

The same proportion of deleterious ingredients in articles of food which are taken sparingly into the stomach might in the largely and constantly-consumed article of bread prove not only dangerous but fatal. Vinegar, pepper and even sugar may be adulterated with deadly poisons—with sulphuric acid, red lead and muriate of tin, and yet the quantity of either of them eaten at any

one time is comparatively so small that no immediately serious effects may seem to follow. The use of much less powerful drugs than these in the every-day and every-meal article of bread might, on the other hand, completely destroy health and greatly shorten life.

It is a well-known fact that the majority of baking powders supplied to families, as well as to the bakeries, are largely composed of alum, As we have shown in the preceding chapter, alum is sometimes added also to the cheaper grades of flour, and, where this is the case, the consumer of the bread is liable to receive a double dose of it.

Of fourteen samples of baking powder analyzed by us, all but three were found to contain alum in considerable quantity. Of twenty samples of bakers' bread analyzed at the same time, sixteen were found to contain alum, though whether it was introduced in a baking powder or added by the baker to whiten the darker grades of flour so generally used we are unable to state. These examinations are certainly sufficient to show that the use of alum, despite all that has been said and written against its use, is very general. The captivating whiteness which it imparts to the bread enables the baker to disguise an inferior and even a damaged flour, and thus to perpetrate a fraud. But did the evil end here we might dismiss the subject without further comment.

Having shown by actual analysis the great frequency with which alum is used, it becomes our duty to consider its effect upon the system. Is it deleterious?

Dr. Darglish, an eminent English authority, says: "Its effect on the system is that of a topical astringent on the surface of the alimentary canal, producing constipation and deranging the process of absorption. But its action in neutralizing the efficacy of the digestive solvents is by far the most important and unquestionable. The very purpose for which it is used by the baker is the prevention of those early stages of solution which spoil the color and lightness of the bread while it is being prepared, and which it does most effectually; but it does more than needed, for while it prevents solution at a time that is desirable, it also continues its effects when taken into the stomach, and the consequence is that a large portion of the gluten and other valuable constituents of the flour are never properly dissolved, but pass through the alimentary canal without affording any nourishment whatever."

According to the great chemist, Liebig, "it hardens the nutri-

tious constituent of the bread, the gluten, and renders it more indigestible.

Dr. Hassall, in his exhaustive treatise on bread and its adulterations, asks: "Is it worth while to injure the properties of the bread by using alum for the sake of obtaining an unnaturally white loaf?" And he adds: "The public, in judging of the quality of bread by its color—by its whiteness—commits a most serious mistake; there is little or no connection between color and quality; in fact, very generally, the whitest breads are the most adulterated. The public, therefore, should lose no time in correcting its judgment on this point."

Dr. Gibbon, writing of alum, says; "Its use in the manufacture of bread is injurious to health, and concurs indirectly with other things in increasing the mortality, especially of young children."

Even cases of actual poisoning by the accidental use of alum are given in the books, while numerous experiments on living animals have clearly demonstrated its corrosive action on the mucous membrane. Even when taken in small quantities, as in bread, it is apt to seriously disorder the stomach and to occasion acidity and dyspepsia.

The most that has been urged in defense of the use of alum is that it undergoes a chemical change during the process of baking by which it is rendered comparatively harmless. The facts of the case clearly controvert this theory.

Dr. Mott, of New York, in a recent paper, says: "Because of the decomposition of the alum by the bicarbonate of soda, some scientific men have been induced to say that 'there was no alum in the baked product' in which the powder was used; thus leading the public to believe, by a trick in wording, that the elements which compose the alum are driven off in the process of baking; while the truth of the matter is, that every element which composes the alum remains in the baked product, which, if eaten, enter the stomach, and are absorbed by the blood, acting the same as alum. This is not only my opinion, but it is the opinion of the leading scientific men of this county, such as Chandler, Barker, Johnson, Morton, Hays, Willard Parker, Alonzo Clark, William A. Hammond, Ryland T. Brown, J. A. McCorkle and J. H. Raymond, of the Brooklyn Board of Health, and many others."

It would seem to be a sufficient condemnation of alum that in England, where its effects have been carefully studied for years, its use by bakers is strictly interdicted by law.

Of the three samples of baking powder analyzed by us and found to contain no alum, one, we were gratified to find, was largely composed of a pure cream of tartar. The acids contained in the other two samples were of a cheaper character, though perfectly wholesome when used in limited quantities. And here we may observe that one of the inducements held out to the public by the manufacturers of alumed baking powders is the cheapness of the article. A powder made from pure fruit acid can not possibly be sold as low as the alum powders.

Bread that has been made with alum powder, when twenty-four hours old, is very apt to crumble and go to pieces. By this means the use of alum in baking powders may sometimes be detected.

Sulphate of copper, as well as alum, has been mentioned as an adulterant of bread, but in our investigations we have failed to discover in any instance the presence of that poisonous salt.

Hassall also enumerates in the list of English adulterants bone ashes, bone dust, white clay, the carbonates of soda, magnesia and lime, and, lastly, mineral white, terra alba, or hydrated sulphate of lime. "These several substances," he remarks, "were chiefly introduced through the flour with which the bread was made."

In view of the foregoing facts, we most thoroughly agree with Dr. Wight, the accomplished and really scientific Commissioner of Health of Milwaukee, that "those who manufacture bread, pastry, candy, etc., should be brought under supervision of the Health office through a special skilled inspector."

Nor is the use of alum or other harmful adulterants of bread the only reason to be advanced in support of Dr. Wight's position. During his investigation of the subject treated of in this chapter the writer has had occasion to visit a number of the larger bakeries, and these visits have generally been made during the night or earlier morning hours, when the machinery of the establishment was in full operation and the entire process of bread-making could be observed. An insight into the manner of manipulating the materials was not in some instances calculated to sharpen our appetite for the fresh white loaf that appeared on our breakfast table the following morning. While in two cases, which we must regard as exceptions, an effort seemed to be made to enforce cleanliness in the methods of handling the materials, as well as in the persons of those engaged about the place, in every other instance there was an evident disregard of all rules of decency, with

an occasional occurrence so grossly unclean as to shock even the least scrupulous. Under a system of inspection such as Dr. Wight has suggested such a condition of things would be impossible. The fear of exposure and consequent loss of patronage would in itself impel the public baker to institute rules of cleanliness in his establishment and insist upon their observance.

CHAPTER V.

CRACKERS, CAKE AND PASTRY.

There is an adulteration of sweet crackers and several varieties of cake which should not be overlooked and must be condemned. We refer to ammonia (volatile alkali), which we have found to be used in cake in such quantity as to be readily detected by the odor, as well as the taste. The purpose it serves the baker is to cause a quick raising, which is especially desired in those varieties of cake which are cooked quickly in a very hot oven. This ammonia is a poison, and under certain circumstances will even produce death. Cases where its use has been attended with fatal results are given in the books.

The ordinary soda crackers which are retailed at the cheaper groceries for less than six cents per pound are really unfit for use. They are not only made from very inferior and frequently from damaged flour, but the dough is allowed in many cases to partially decompose or rot before it is baked. This decomposition, it is claimed, renders the crackers brittle. We are informed by an experienced baker that sulphuric acid is also quite commonly used for "clearing the crackers."

A really good and wholesome soda cracker can not be manufactured and sold at wholesale for much less than nine cents per pound, and yet crackers of the kind we have just described are often retailed for four cents per pound.

The pies supplied from the city bakeries are often manufactured with regard only to their cheapness. The crust, in lieu of being shortened with butter, is sometimes made with grease of a very inferior and even impure quality. A preparation of tallow, sometimes called bakers' butter, has been quite extensively used, though we believe it has to some extent been supplanted of late by oleomargarine.

The mince-meat of the bakeries we have often found composed of the cheapest grade of dried apples, an inferior meat—and very little even of that—and impure spices for seasoning.

The introduction of corn-starch in custard and pumpkin pies frequently enables the baker to largely dispense with the use of eggs.

The very cheap articles so often met with at the coffee stands and lunch houses in the vicinity of the docks and railroad depots, and known as Washington pie, railroad cake, etc., are made up chiefly of the refuse and waste material of the bakeries, old and musty cakes, waste fruit, a little spice and much molasses.

CHAPTER VI.

GLUCOSE.

The twin inventions which the present century has contributed as the fitting climax to a long-continued era of unchecked fraud and food adulteration are oleomargarine, or false butter, and glucose, or spurious sugar. The first-named substance has been already considered at length in these pages. The second will be made the subject of this chapter.

The discovery of the process of converting starch into sugar was made by Kirchoff, a Russian chemist, as early as 1811. The traffic in colonial sugars at that time being interdicted by Napoleon, the announcement created the most intense excitement. It was thought the sugar problem had been finally solved, and factories for the production of the new sweet were straightway erected both in Germany and France. The excitement soon subsided, however, upon the discovery that glucose was very inferior in sweetness to cane sugar.* The invention of the process for extracting a better sugar from beet root occurred also about this time, and had the effect of putting a temporary stop to the whole glucose business.

But it was found impossible to produce a palatable table syrup from beet sugar, and after a time the question of the feasibility of manipulating the starch into an uncrystalizable syrup was again agitated, and received more or less attention up to 1832, when the chemist Payen brought out an improvement upon the original Kirchoff process. Payen was soon followed also by Musculus and Dubrunfault with further improvements, which at once gave a new life to the abandoned enterprise. To adopt the language of one of the glucose historians, "Factory followed factory throughout

*One pound of cane sugar has the same sweetening power as 2½ pounds of glucose.

France and Germany. Better and improved machinery and methods were discovered continually. The sugar, at first a brown, bitterish product, became a pure, white and sweet article, and was found to contain all the elements for the amelioration of beer, wine and vinegar. It was also found that the saccharine principle could be checked and the syrup turned into a gummy substance, equal in its elements to the best quality of gum arabic."

In France and Germany there were, in 1838, only nineteen factories. In 1867 this number had increased to sixty-seven, and in 1878 to eighty-four.

As the demand for table syrup in Europe is very light, it should be stated here that fully seven-eighths of the product of these factories is used for manufacturing purposes. Such is far from being the case, however, in our own country, and the consideration of this fact naturally brings us to the introduction of glucose in the United States.

Mr. M. M. Baldridge, in a recent contribution to the daily press, says: "In the fall of 1865, when residing in New York city, I received a letter from one of my friends in France, a manufacturer of glucose, by which he advised me of having shipped a keg of his white, dense glucose, with a request to compare his product with the best article made in this country. He wished to know what progress the business had made in the United States. The sample glucose which arrived was an excellent article, and at once I took steps to investigate the matter. To my utter surprise, no glucose could be found for comparison. The article was actually so little known that the wholesale confectioners declared they had never heard even of the name. I then commenced to work over some of the glucose into a sweet syrup, and introduced a sample of it to one of the heavy sugar brokers. When I told him that the main base of the syrup was starch, and it could be produced pound for pound, he refused to believe me, but I partly convinced him by proving the fact from some scientific works, and by letters from European manufacturers. A few days after Wall street was in an excitement. Corn syrup was introduced, and its career opened for the United States."

It is hardly necessary to remark that in the few years which have elapsed since glucose threw Wall street into a flutter numerous factories have sprung up all over the country, while many more are in process of construction, flooding and to flood the land with this spurious sweet.

Before considering the question of the purity and wholesome-

ness of glucose it is important that we should understand the process of its manufacture, as we will then be able to account more readily for the presence of certain impurities with which we find it almost invariably contaminated. This process, as given by Payen, the chemist, may be described as follows:

The saccharification of the starch is carried on in large wooden vats, capable of holding 2,800 gallons. The contents of the vat may be heated by forcing in steam through a coiled steam pipe at the bottom. The steam pipe is perforated, to permit the steam to escape at many points into the contents of the vat. In France the steam pipe is made of lead; in this country they use iron pipes. When two tons of starch are to be converted into sugar, thirty-two barrels of water and about eighty pounds of sulphuric acid are placed in the vat, and the whole heated to 212 degrees by forcing in steam. Two hundred pounds of starch are then mixed with twenty-two gallons of water and stirred up, and four or five gallons of this mixture are run into the vat. The temperature is kept up to the boiling point all the while, and successive charges of starch are run in till the whole amount is converted into sugar. The steam is then shut off, and chalk is added in sufficient quantity to neutralize the sulphuric acid, but if too little chalk is used, free sulphuric acid will be left in the contents of the vat. The sparingly soluble sulphate of lime is formed, and much of it settles to the bottom of the liquid; the clear liquid is drawn off and evaporated by steam heat till the proper density of syrup is secured, or until it will crystalize on cooling and standing for several days, according as they seek to make syrup or sugar.

Analyses of glucose and glucose syrup have been made by Prof. Charles R. Fletcher, Lecturer on Chemistry in Boston University and State Assayar of Massachusetts; by Prof. R. C. Kedzie, of the Agricultural College of Michigan, and more recently by Prof. Geo. A. Mariner and Dr. T. D. Williams, of Chicago, as well as by hundreds of other highly competent and credible analysts throughout the country.

Prof. Fletcher, in a letter to Mr. G. T. Angell, the distinguished humanitarian and reformer, of Boston, says: "I have recently made three analyses of glucose and two of glucose syrup, and have found *quantities* of free sulphuric acid *in every* case."

Prof. Mariner, in a letter to the same gentleman, says: "I have examined several syrups made essentially and entirely of glucose, and found in them chlorides of tin, calcium, iron and magnesia, and in quantities which made them very poisonous."

A family by the name of Doty, living at Hudson, Michigan, recently purchased some syrup of a grocer in that village. The members of the family ate freely of the syrup and were all made very sick by its use. They became alarmed and sent a can of the syrup to the Michigan Agricultural College for analysis, supposing it to contain poison. The result of the analysis of this syrup induced Prof. Kedzie, of the university, to examine a number of table syrups purchased promiscuously from the grocery shops. The result of these investigations, as reported by Prof. Kedzie, was as follows:

No. 1.—Pure cane sugar syrup.

No. 2.—Starch sugar syrup. Contains some sulphate of iron (copperas), and contains in each gallon 107.35 grains of lime.

No. 3.—The grocer called it "poor stuff." I have seldom seen an article that better sustained its recommendation. Made of starch sugar; contains plenty of copperas and 297 grains of lime in a gallon.

No. 4.—Nearly pure cane sugar syrup.

No. 5.—Starch sugar syrup. Contains copperas, and 100 grains of lime in a gallon.

Nos. 6, 7, 8.—All made of starch sugar. Contain sulphate of iron and plenty of lime.

No. 9.—This is the specimen from Hudson which caused the sickness in the Doty family. A starch sugar syrup; contains in the gallon 71.83 grains of free sulphuric acid, 28 grains of sulphate of iron, and 363 grains of lime.

No. 10.—Contains starch sugar, copperas and lime—amount not estimated.

No. 11.—A starch sugar syrup. Contains in the gallon 141.9 grains free sulphuric acid, 25 grains sulphate of iron, and 724.83 grains of lime.

No. 12.—Contains starch sugar, seasoned with sulphate of iron and lime.

No. 13.—Starch sugar. Contains in the gallon 58.48 grains of sulphate of iron, 83.14 grains of free sulphuric acid, and 440.12 grains of lime.

No. 14.—Starch sugar. Contains in a gallon 80 grains of free sulphuric acid, 38 grains of iron and 262.48 grains of lime.

Nos. 15, 16.—Contain starch sugar, sulphate of iron and lime.

No. 17.—Starch sugar, sulphate of iron and 202.33 grains of lime.

Dr. Williams has made a careful analysis for us of a number

of samples of glucose syrup and of sugars adulterated with glucose, in every case finding free sulphuric acid.

The presence of all the impurities found by the chemists whom we have quoted are readily accounted for. If iron pipes are used for conveying the steam for heating the contents of the vat, the sulphuric acid will attack and dissolve some of the iron, and thus sulphate of iron (copperas) will appear. If too little chalk is used free sulphuric acid will remain in the syrup. The chalk being carbonate of lime, its use will explain why lime is sometimes found in the syrup in large quantities.

Prof. Kedzie observes: "As chalk is insoluble in water, and sulphate of lime is very sparingly soluble, many persons would suppose that little or no lime would remain in these syrups. But we must bear in mind that sugar itself acts the part of an acid with many substances. Thus there are two well-known salts formed by combination of lime and sugar; one containing one equivalent of lime to one of sugar, the other containing three equivalents of lime to one of sugar.

"These sucrates of lime have lost, entirely, the sweet taste characteristic of sugar, and have a bitterish taste instead. Last spring some students at this college brought me a small quantity of a whitish, granular mass, which deposited from the maple syrup in 'settling' to make maple sugar. The sugar boilers called it *sand*, as it is hard and gritty, insoluble in water, and destitute of any sweet taste. On analysis I found the material to be nearly pure sucrate of lime, containing in addition a small amount of phosphate of magnesia. Here was the natural formation of the sucrate of lime from the elements of plant food contained in the sap.

"Not only will sugar thus combine with lime, oxide of lead, oxide of iron, etc., but it will associate with itself sulphuric acid, and form a compound acid which comports itself very differently from simple sulphuric acid. This sucro-sulphuric acid forms a pretty large class of salts which are soluble in water, but especially soluble in solutions of sugar. Re-agents which will readily precipitate sulphuric acid and sulphates, *e. g.*, chloride of barium, will not precipitate the sucro-sulphates.

"Glucose has the same power as an acid substance as sucrose, forming a class of soluble glucosates. It will also associate with itself sulphuric acid, and form a class of gluco-sulphates. Undoubtedly a large part of the lime found in these starch-sugar syrups exists in the form of gluco-sulphate of lime."

Does the reader ask: Can a glucose be produced that will be entirely free from the impurities which the above analysis have discovered?

We answer, It can.

Does he further inquire how and where this result can be accomplished, and why it has not been accomplished by the glucose manufacturers?

Let us reply that it can be accomplished in the laboratory of the chemist, with absolutely pure materials and the exercise of the greatest care in their manipulation. But made in quantity, as it is in the factories, of materials which the chemist would reject, glucose can not be other than we find it. In short, the glucose of the laboratory and the glucose of commerce are very far from being one and the same thing. The product of the factory can be sold at a profit for three cents per pound. The article produced by the chemist could not be manufactured upon either a small or a large scale for any such price. And not until a more expensive article of glucose is placed upon the market can we hope or expect to find it free from impurities more or less deleterious and dangerous.

But even should the question of the purity and wholesomeness of this new article of commerce be finally settled in the affirmative, there is still this to be urged against it: When sold for cane sugar or cane sugar syrup, it is an unquestionable deception and fraud. It will not supply the sweetness which cane sugar furnishes and it can not therefore honestly take the place of cane sugar. We have already shown that its saccharine power stands as one to two and a half of cane sugar. However pure and harmless it might be, it would still be a dilutant, and its addition to or substitution for cane sugar would be only to cheapen and to cheat. Its relation to cane sugar is very similar to that of water to milk. It is no more cane sugar than oleomargarine is butter.

The extent to which this spurious sweet enters into the preparation and manufacture of articles of food will appear in the chapters that follow.

CHAPTER VII.

SUGAR AND SUGAR SYRUPS.

It is stated by Dr. Letheby, in his admirable work on "Food," that the Anglo-Saxon population of England and America consume annually 41.4 pounds of sugar per head, or more than any other race of people. Being peculiarly a sugar-consuming nation, whatever relates to our supply of sweets must especially affect and interest us.

The books inform us that there is a large class of substances included in the general term of sugar, though there are only two of sufficient commercial importance to demand attention in these pages. One is termed by the chemist *sucrose*, and includes cane, beet and maple sugar, all of which are identical and possess precisely the same amount of sweetening power.

The second class is known as *glucose*, or grape sugar. It is the sugar which in its pure and natural state we find sometimes in the raisin. It is also possible to produce this sugar artificially from old cotton and woollen rags, from paper, sawdust and countless other materials, though it has not been found profitable to do so because of the time and expense required to make the chemical change, as well as the difficulty attending the purifying and decoloring of the sugar when it is produced. That it can be readily and economically produced from starch, however, we have already shown in the preceding chapter.

It is to *sucrose* or the products of the sugar cane that we wish to devote this chapter; these being the sweets which are generally supplied the consumer by his grocery man.

The adulteration of sugar of the lower grades has been practiced in almost all countries, and the adulterants used have been

quite numerous. The ordinary brown sugars, when made from juice which has not been thoroughly filtered and cleansed, have been found also to contain what we may term accidental impurities in very large quantities, such as fragments of the cane, sporules of fungus, acari, or sugar insects, and glucose.

The adulterants, at one time used in England and also to some extent in this country, were starch, gum and dextrin, marble dust, chalk, sand, bone-dust and common salt. But nearly, if not quite all of these, seem to have given place within the past few years to a single article—glucose—which would seem to have become a universal adulterant. Such being the case, we will confine our consideration of the adulteration of sugar to its being accomplished by the aid of this one article, except in the case of refined or white sugars where certain metallic and other agents are used for bleaching purposes.

We have already had occasion to observe that glucose is often met with in ordinary brown sugar as a natural impurity, but it should be borne in mind that its presence is never discovered in such cases in any large quantity. Whenever it is found to be present to any considerable extent, it has been added as an adulterant.

Until very recently it was found by the sugar manipulators impossible to add glucose beyond a certain quantity, say from 10 to 15 per cent., without affecting the appearance and general character of the sugar to such an extent as to lessen its value. By a recently discovered process, however, very much larger quantities are introduced and in such a manner as to render its presence quite unnoticeable. The article thus adulterated has come to be known among the initiated as " new process " sugar.

Six samples of brown sugar were procured by us from six different sources, and submitted to Dr. T. D. Williams for analysis. His examination of them developed the fact that they all contained glucose, as follows: No. 1, 33⅓ per cent.; No. 2, 7½ per cent.; No. 3, 13½ per cent.; No. 4, 41⅓ per cent.; No. 5, 7 per cent, and No. 6, 16⅔ per cent.

Numbers 1 and 4, which contained respectively 33⅓ and 41⅓ per cent. of glucose, were both very light-colored and dry, and would be selected by the ordinary purchaser as fine articles of sugar. It is hardly necessary to remark that they are sugars of the " new process."

Numbers 3 and 6, which contained respectively 13½ and 16⅔

per cent. of glucose, were of a much darker color and apparently of a much lower grade.

To illustrate the extent to which this adulteration of sugar with glucose prevails, we may state that a member of a well-known firm of manufacturing bakers remarked to the writer, during his investigations, that he had abandoned trying to procure a really pure sugar in the North, and had been compelled to order direct from producers in the South. "How long it will be," he added, "before they also learn the trick of adulteration, I cannot say, but it is not apt to be very long."

We could refer to many other analyses made by competent chemists at other points which only go to confirm the correctness of the results reported to us by Dr. Williams.

We have already referred to the impurities met with in glucose which, in our opinion, render its wholesomeness and safety as an article of diet, to say the least, very questionable. If these impurities exist in the glucose they are necessarily introduced in the sugar when it is adulterated with that article.

But however harmless these adulterated sugars might be, so far as their effect on the health of the consumer is concerned, there is a fraud involved in the sale of glucose for sugar which cannot be too strongly condemned. As we have had occasion to observe in the preceding chapter, glucose affords only one degree of sweetness to two and one-half degrees afforded by sugar. The person, therefore, who purchases sugar thus adulterated, is defrauded of the very thing for which he pays his money—viz., the sweetness. An instance of the effects of this fraud was brought to our notice where a farmer's wife purchased, as she supposed, sugar with which to preserve her fruit. Instead of a pure sugar she was sold an article containing about 30 per cent. of glucose. She had followed the time-honored formula of a pound of sugar to a pound of fruit, but to her great disappointment and loss she discovered, a few months later, that her summer's labor had been wasted, and that her preserves had spoiled. There had not been sufficient saccharine strength in the sugar she had used to keep them.

Other and very similar cases might be given where the loss suffered has not been confined to the difference in the cost or value of the sugar and its substitute.

But if sugar is thus adulterated the adulteration of syrup is carried to even a greater length. We have referred to the discoveries made by Prof. Kedzie, of Michigan, in analyzing a num-

ber of samples of table syrups procured from different dealers in that State. Our own investigations fully confirm the correctness of the results reported by him.

In twenty samples of syrups examined by us, only one was found to be pure and unadulterated, while several of the samples consisted almost wholly of glucose, there being barely a sufficiency of cane syrup added to impart flavor and odor.

Referring again to the wholesomeness of glucose, we may observe that a merchant supplying us with a number of the best samples we were able to procure, viz., those containing the smallest proportion of glucose, expressed the opinion that his own observation had convinced him that glucose is not a safe or wholesome article of food, "though," he continued, "it would be quite out of the question for us to try to sell only a pure cane syrup."

A wholesale merchant in Michigan, not long since, supplied twelve lumber camps with syrup, the supply in every case coming from the same manufacturer. In every one of the twelve camps sickness followed of a character which could be traced to no cause but the syrup, which had been used. This syrup consisted of about three parts of glucose to one of cane syrup.

With regard to the impurities and poisons which have been discovered in refined sugars, it may be stated that Prof. Geo. A. Marriner, of Chicago, in analyzing twelve samples, procured promiscuously, found muriate of tin in every one of them, the amount varying from a mere trace to what might be termed a poisonous quantity.

The students in the School of Mines, of Columbia College, New York, extracted quantities of tin from sugar which they hung in beads to the necks of the bottles from which the sugar was taken.

The use of tin for bleaching sugars has, no doubt, been very general, though we are inclined to the belief that in some cases the practice has been discontinued. Analyses made under our direction, during our investigation of this subject, led us to this conclusion. Out of six samples of refined sugars examined, two were found to contain no trace of that metal.

CHAPTER VIII.

HONEY AND OTHER SWEETS.

There are few luxuries of the table which would seem to be more adulterated than honey. Several English analysts mention as the more common adulterants starch and cane sugar, while Mitchell and Normandy enumerate also chalk, hydrated sulphate of lime and pipe clay. The use of starch is accounted for on the ground of its giving weight and bulk, its improving the color of very dark honey, and its correcting a sharp and acidulous taste which old honey is apt to acquire.

The writer has reason to believe that all the adulterations named by these English authorities, while they were at one time more or less used in this country, have of late years been discarded, even cane sugar having found a substitute in this, as in many other instances, in the cheaper article of glucose.

It is entirely safe to say that with hardly an exception the extracted or combless honeys offered in the grocery shops are simply glucose, with barely a sufficient admixture of honey to give flavor. And even much of that which is palmed off as comb-honey is but very litttle better. The deception is often practiced thus: A thin strip or section of comb-honey is placed perpendicularly in a bottle or glass jar, sufficiently large to one-fourth or even one-third fill the vessel. The bottle or jar is then filled with glucose, corked, sealed and labeled "Pure Clover Honey." The goods thus offered are at least very attractive to the eye, and the appearance of the comb in the transparent liquid has the desired effect of disarming suspicion as to its being the genuine product of the apiary.

The profits of such deception are, of course, enormous, and readily account for the extent to which it is carried. An individual who has long enjoyed the reputation of being a purveyor of pure

honey in one of the larger western cities, and has had an almost exclusive family trade, was found by the writer to be delivering to his patrons an article composed of about equal parts of honey and glucose.

At the fifth annual meeting of the Western Illinois and Eastern Iowa Bee-Keepers' Society, held in 1879, an interesting report on the adulteration of honey was submitted by Mr. Charles Dadant, of Hamilton, Ill. Mr. Dadant said: "About ten years ago I had sold to a honey dealer in Chicago several barrels of extracted honey. The price then was high—seventeen cents per pound. Soon after I was informed that the same firm was retailing clover honey in small bottles and tumblers, for about the price or even less than they had paid me at wholesale. Of course I became convinced that my pure honey had been used to give the taste of honey to some cheap article, and that the mixture was sold as pure clover honey. But it did not occur to my mind that so poor an article as glucose could be used, and I imagined that a strong solution of white sugar had been used, the comparatively low price of sugar giving a fair margin to the adulterators. I then wrote an article on adulteration showing that unprincipled dealers were able to undersell the bee-keepers. My figures were based on a mixture of honey and sugar syrup, and on this the profit was handsome, but no doubt these dishonest dealers sneered at me, for their profit by using glucose was at least four times greater."

Let the reader bear in mind that at the time Mr. Dadant sold his honey at seventeen cents, glucose was worth less than four cents per pound, and he can form his own estimate of the profitableness of the adulteration.

In the same report from which we have quoted, Mr. Dadant says: "This rapid enriching of the adulterators was too apparent not to tempt some of the dealers. Many of these dealers, eager to get rich, took up the nefarious business, and soon the whole continent of North America was found too narrow for their operations; they reached their dishonest hands across the sea to sell their fraudulent products in the markets of the Old World. But most of the countries of Europe have strict laws against the sale of adulterated articles. Not long since a grocer of Glasgow, Scotland, was fined for having sold spurious honey from America, *adulterated with 57 per cent. of glucose.*"

Pure extracted honey generally granulates or candies in a very short time after being taken out of the comb, while that which is adulterated with glucose never does. The very reverse

of this idea has, however, been generally entertained, and has no doubt lead the consumer to believe that the candied honey was a spurious article, while the liquid honey was pure. No doubt the adulterators of honey, unable to manufacture a mixture that would granulate, have taken no little advantage of this popular fallacy.

In an able article upon the proper method of preventing the adulteration of honey, in a recent number of the *American Bee Journal*, the writer says: "We want to school dealers and consumers in selling and buying *candied* honey." And as a means of avoiding imposition we can suggest no better rule.

The candied honey can at any time be reduced to a liquid state by putting the jar or vessel in hot water. The cork should be loosened and the water heated moderately, so as not to crack the jar.

The greatest credit is due the bee-keepers for the efforts they have made, both individually and through their associations, to arrest the adulteration of honey and other sweets, and it is only to be regretted by every lover of honesty, as well as honey that their appeal to Congress for legislation to this end has thus far proven fruitless. When it is considered that in the city of Chicago alone over 450 tons of honey are sold annually, the importance of protecting its purity can be estimated.

A few years ago an individual made a contract for the sweepings and scrapings of the floors of one of the largest manufacturing confectionery establishments of the Northwest, the consideration being that he should clean the floors two or three times a week without expense to the manufacturer. The person who entered into this contract was at the time engaged in the manufacture and sale of maple sugar and maple syrup, and it is hardly necessary to remark that he found a use for the sweetened filth and drippings which he obtained from the candy factory floors. Possibly the novel idea of utilizing this debris may have been suggested by the boiling down of the salty water obtained by washing the earth under the smoke-houses of the South during the war—a process by which the scarce and expensive article of salt was sometimes obtained during the blockade.

We do not cite this incident as illustrative of the ordinary methods of adulterating the sugar and syrup of the maple tree. It is merely given as an extreme case, going to show the resources to which the ingenious and unscrupulous adulterator may have recourse.

Observation as well as analyses have convinced us that only a

very small per cent. of the products of the sugar tree reach the consumer in their pure and natural state. Our "Pure Vermont Maple Sugar" is more frequently a product of the cane plantations of the South, or even the grain fields of the West, than it is of the honest maple groves of New England. Cane sugar is largely used as an adulterant of maple sugar and glucose as an adulterant of maple syrup. In either case the quantity of the maple product used is often barely sufficient to impart flavor, as in the case of gluco-honey. Glucose has of late been adopted also as an adulterant of the sugar, as well as the syrup of the maple, its cheapness rendering it preferable to cane sugar. We have found in several samples of cheap maple sugar examined by us terra alba present in considerable quantity, from which we infer that it is likewise a common adulterant. As this white earth is delivered to the manufacturer at a cost of little over one cent a pound, while glucose sells for about three cents, we can at once see how a maple sugar largely composed of these two substances can be produced at a very trifling expense and a very large profit.

CHAPTER IX.

JELLIES, PRESERVES AND FRUIT BUTTERS.

It is by no means a pleasant task, however much of a duty it may be, to undeceive a credulous public with regard to the purity and wholesomeness of those articles which have come to be cherished as table luxuries. But an expose of the adulterations and shameless frauds practiced by the purveyors of domestic supplies would be incomplete without a reference to the manner in which the jellies, preserves, and that seemingly most innocent article, apple butter, are prepared in the factories or rather the labratories whence they are supplied in astonishing quantities to our "family grocer."

The writer can assure his readers that his investigations in this direction have not been unattended with serious difficulties and frequent rebuffs. Indeed but one manufacturer out of a large number called upon showed any willingness whatever to be interviewed as to the mysteries of his art. In this single instance it is only fair to state that no effort at concealment was made, and probably for the simple reason that there was little to conceal. The only adulterant used in the establishment was glucose—substituting it for sugar— and this in very limited quantities.

This attempted concealment on the part of the manufacturers will be understood when the writer states, after a careful examination and analysis, that with rare exceptions the articles ordinarily offered as jellies and preserves are simply sweetened and colored abominations.

The base of nearly all the jellies turned out in these establishments is what is termed apple juice. Green apples, when they can be purchased to advantage, or, when green apples are out of season, dried apples are boiled until they can be strained through a coarse cloth or bag, the only residue being the seeds, pealing

and coarser fibrous portion of the fruit. This residue or pulp, as we will call it, remains to find another use as will be shown further on.

Now suppose we wish to prepare a raspberry jelly. We will adopt for our guidance a recipe actually in use in one of these establishments; viz.:

8 gallons apple juice.
16 lbs. sugar.
8 lbs. glucose.
1 oz. sulphuric acid.
¼ lb. corn starch.

Add to this compound the coloring (an aniline poison) and raspberry flavoring (acetic ether) and we have a "Pure Raspberry Jelly." If it is desired to produce a strawberry or currant instead of a raspberry jelly it is only necessary to change the flavoring.

It would be hard to conceive a more fraudulent compound than the above, and yet one sample out of five analyzed by us was found to contain no trace of fruit whatever, not even the almost omnipresent "apple juice." This "pure jelly" was little more than common glue colored and strongly flavored.

Upon the authority of an extensive and experienced manufacturer it may be stated that a jelly cannot be made from the fruit itself and sold for less than 12 cts. per lb. And yet there is hardly a large city where so-called fruit jellies, carefully put up in glass and attractively labeled, are not peddled as low as 4 cts. per lb. What else can they be but the basest imitations and frauds?

Upon the same authority we may further state that a jelly cannot be made from apple juice, cane sugar, tartaric acid and pure fruit flavoring, for much less than 8 cts. per lb.; and yet the most that can be said of this jelly is that it is a harmless imitation, and when sold as anything but an apple jelly, not what it is represented to be.

The preserves and jams usually met with in the grocery shops show upon investigation little less adulteration than the jellies. They are in most cases made with glucose and freely adulterated with apple pulp, starch and other foreign ingredients. Damaged and unsalable fruits, such as figs, prunes, etc., are also frequently purchased in quantities by the manufacturers and used to advantage. It is entirely safe to say that in not more than one case out of five are they either pure or wholesome.

The process of manufacturing a cheap apple butter will as-

tonish if it does not shock the consumers of that simple article. The residue or pulp of the apple, to which we have previously referred, and which has been deprived of the saccharine and acidulous characteristics of the fruit, leaving it practically "tasteless as a chip," is generally made the base of apple butter. The missing sweetness and acidity are readily restored by the use of glucose and sulphuric acid, and this mixture, with the addition of spice, is sometimes all there is to the compound. More frequently, however, starch is added in considerable quantities and often foreign vegetable and fruit matter. In one case within the knowledge of the writer the waste leaves and stalks of cabbage were used. In any event there is no element or characteristic of the compound that is not an insult to the innocent apple.

In connection with his investigation of this subject there fell into the hands of the writer a letter and circular from a firm of "consulting and analytical chemists" in St. Louis, from which it would seem that the inventive genius of the country, not satisfied with its already wonderful achievements in the art of deception and fraud, is still laboring with the problem of how to produce still cheaper and more villainous stuff in the guise of food. The letter, which was addressed to a Chicago manufacturer, was as follows:

DEAR SIR:—We wish to sell the exclusive use of a process for making a jelly different from any now on the market and costing *less than four cents per pound.* It is purely vegetable and *perfectly healthful.* Resp'y, —— ——.

In the circular accompanying this letter these St. Louis gentlemen advertise themselves as prepared to give "confidential consultation upon the *utilization of waste products,*" in view of which fact the reader can draw his own inference as to their proposed new process of making jelly to cost less than 4 cts. per lb.

CHAPTER X.

CONFECTIONERY.

If no other consideration impelled us to give the subject of confectionery our careful attention, the fact of its being chiefly consumed by the young should do so. To deprive childhood of any one of its delights would seem cruel, but how much more cruel it must seem to deprive it of that without which no pleasure can please and life itself is rendered prematurely a burden, to deprive it of the sweetest of all sweets—health. If it is unsafe to give our children candy, it is not because candy is in itself unwholesome, but because it has been rendered so by the black arts practiced by the modern confectioner, who would seem to have adopted Herod as his exampler and patron saint. Instead of being unwholesome or injurious, a pure candy supplies not only a pleasant but an essential element of food. It is only when it is made the vehicle for carrying into the sensitive stomachs of the young insidious poisons that its use should be condemned.

Cane sugar, when absolutely pure, is one of the most wholesome dietetic articles known to biological science. Its convertibility into grape sugar being more readily performed than is the conversion of farinaceous food, cane sugar should oftener preclude the use of starch food. The presence of both cane sugar and milk sugar in the infant stomach is not only tolerated, but it is also allowed; and, in most instances, with greater impunity and with greater nutritive effect, providing other nitrogenous matter is present, than is the case when starch food is used alone. The evidence corroborating this assertion is manifold. Thousands of infants who, being deprived of their natural aliment, their mothers' milk, and who are on this account inclined to waste away on a farinaceous diet, are saved by the use of condensed milk, the presence of which could not have been borne because of the large

amount of indigestible casine, were it not for the presence, also, of so great a quantity of saccharine matter, particularly milk sugar.

Cane sugar being healthful, the form in which we partake of it, or the method by which it is carried into the stomach, is of but little importance. If it be an ingredient of either food or drink, or in the form of a confection, it matters not if it be but pure. Confectionery is only dangerous when rendered impure by the use of adulterants, poisonous coloring matter and artificial flavoring essences, or where used to excess.

We regret to state that our investigations have lead us to believe that only a small portion of the candy sold in the shops is free from adulteration while very much of it is rendered absolutely poisonous by the flavoring and coloring substances made use of by the manufacturers. In fact no article we have examined would seem to be adulterated so generally and to so great an extent.

Dr. T. D. Williams, who has rendered us constant and valuable assistance throughout our researches, recently had occasion to analyze one hundred and fifty samples of confectionery purchased promiscuously from street vendors as well as from the candy shops. Of these one hundred and fifty samples he found one hundred and twenty-seven more or less impure. The most common adulterant discovered was glucose. The analyses were made, in fact, with special reference to ascertaining the extent to which this substance is used by the confectioners as a substitute for cane sugar, and the result will be read with interest. Terra alba, (white earth) was likewise frequently found and in large quantity, also the poisonous flavoring extracts manufactured of acetic ether, French aniline colors, starch, flour and dextrin. We will give the result of a few of these analyses, which are only a fair sample of the whole:

1. *Mint Drops*, 16⅔ per cent. glucose, balance cane sugar.
2. *Rose Drops*, 26⅔ per cent. glucose, balance cane sugar.
3. *Molasses Candy*, 20 per cent. glucose, balance molasses.
4. *Jelly Paste*, 37½ per cent. glucose, balance gum and cane sugar, colored with cochineal.
5. Five samples of *Caramels*, 18 per cent. glucose, a small quantity of fat (possibly butter), balance cane sugar, chocolate and vanilla flavoring.
6. *Fruit Jelly*, 33⅓ per cent. grape sugar, balance flour and cane sugar.
7. *French Creams*, 7 per cent. glucose, balance cane sugar,

with a small per cent. of starch and about 2 per cent. of cream.

8. *Chocolate Caramel*, 12 per cent. glucose, balance chocolate (about 4 per cent.), cane sugar and a small quantity of fat.

9. *Orange* (gum) *Cake*, 18 per cent. glucose, balance gum arabic, cane sugar and fruit (orange) rind.

10. "*Buffalo Bill*" *Molasses Candy*, all glucose, covered with a thin coating of chocolate.

11. *Chocolate Caramel*, 33 per cent. glucose, balance cane sugar, with about 3 per cent. of chocolate.

16. *Home-Made Molasses Candy*, 83 per cent. glucose, balance molasses.

17. *Jelly Images*, 16⅔ per cent. glucose, balance cane sugar to make jelly (?) the body being a composition of flour, cane sugar and chocolate.

18. *Peanut Bar*, 83 per cent. glucose, balance burnt cane sugar.

19. *Conversation Lozenges*, 10 per cent. terra alba, balance starch, gum and cane sugar.

20. *Jelly Paste*, all glucose and gum, colored with cochineal.

21. *Molasses Candy*, chocolate coated, 67 per cent. glucose, balance cane sugar; in this there is about 3 per cent. of chocolate.

22. *Home-Made Molasses Candy*, 40 per cent. glucose, balance molasses.

23. "*Black Ball*," (three for a cent), lamp-black, terra alba and sufficient sugar and starch to form them; the whole being flavored with the oil of anise seed.

It is proper to observe that the last sample, also Nos. 21 and 22 were purchased in the vicinity of one of the public schools, where they are sold in large quantities to the children, owing to their cheapness—the greatest possible quantity for the least money.

The justly-named "Black Ball," (terra-alba, lampblack, etc.,) was, we are informed by an intelligent confectioner, a Boston invention, and has only recently made its appearance in the West.

In submitting the above analyses to us, Dr. Williams says, with reference to glucose: "This chemical product is used by the confectioners as a substitute for cane sugar and is almost invariably found present in candy, in quantities varying from 7 to 100 per cent. As an article of diet, being a chemical production, liable to be contaminated with sulphuric acid, sulphate of lime, lead, arsenic, etc., it should be looked upon at least with suspicion."

The poisonous coloring of candy has probably been more agi-

tated in our own country, as well as in Europe, than any other subject of adulteration, and not without good results. There is a marked improvement in this respect in the confectionery of to-day over that of even ten years ago. But the practice of employing dangerous, mineral pigments is still continued, to some extent, by the more unscrupulous manufacturers, and it is impossible to analyze any considerable number of samples without detecting their presence. About the only safe rule to adopt, is, to reject all colored confectionery.

The Council of Health of Paris issued, some years ago, the following list of colors used by the confectioners, dividing them into two classes, those which can be used with safety, and those which are more or less dangerous:

List of Colors, the Use of Which May Be Permitted.	*List of Colors, the Use of Which Should be Prohibited.*
YELLOWS.	YELLOWS.
Saffron.	Gamboge.
Turmeric.	The three chrome yellows, or chromates of lead.
French berries.	Massicot, or protoxide of lead.
Lake of ditto, or yellow lake.	Yellow orpiment, or sulphuret of arsenicum.
Persian berries.	King's yellow, or sulphuret of arsenicum, with lime and sulphur.
Lake of ditto.	Iodide of lead.
Quercitron bark.	Sulphuret of antimony, or Naples yellow.
Lake ot ditto.	Yellow ochre.
Fustic wood.	
Lake of ditto.	
REDS.	REDS.
Cochineal.	Red lead, minium, or red oxide of lead.
Lakes of ditto.	Vermillion, or bisulphuret of mercury.
Carmine and	Red orpiment, realgar, or bisulphuret of arsenic.
Brazil wood.	Iodide of mercury.
Lakes of ditto.	Red ferruginous earths, as Venetian red, etc.
Pink madder lake.	
	BROWNS.
	Vandyke brown.
	Umber.
PURPLES.	PURPLES.
Madder purple.	All purples resulting from the mixture of any of the prohibited reds or blues.
Logwood and indigo.	
Any of the lakes, with indigo of litmus.	
BLUES.	BLUES.
Indigo.	Prussian blue, or ferrocyanide of iron.
Litmus.	Indigo.
	Antwerp blue, a preparation of Prussian blue.
	Cobalt.
	Smalt, a glass of cobalt.

List of Colors, the Use of Which May Be Permitted.	*List of Colors, the Use of Which Should be Prohibited.*
	Blue verditer, or sesquicarbonate of copper.
	Ultramarine, a double silicate of alumina and soda, with sulphuret of sodium.
	German or artificial ultramarine, which resembles in its composition natural ultramarine.
GREENS.	GREENS.
Sap green (juice of Rhamnus catharticus).	The three false Brunswick greens, being mixtures of the chromates of lead and indigo.
Yellow lake, or French berries, and indigo.	Mineral green, green verditer, or subcarbonate of copper.
Any of the vegetable yellows, or lakes, with indigo, including Persian berries and indigo.	Verdigris, or diacetate of copper.
	Emerald green, or arsenite of copper.
	The true Brunswick greens, or oxychlorides of copper.
	False Verditer, or subsulphate of copper and chalk.
	THE VARIOUS BRONZE POWDERS.
	Gold, silver, and copper bronzes; these consist of alloys, in different proportions, of copper and zinc.
	White lead, or carbonate of lead.

There are very few, if any, of the colors in the right-hand column which have not been used by the American, as well as the French confectioner, though as we have observed, public sentiment has lately compelled a partial abatement of the practice. A new class of colors, known as aniline dyes, and prepared from crude petroleum and coal tar, have also come into use within the past few years, and are quite extensively employed by the confectioners as well as by jelly manufacturers and others. As they are all apt to be more or less contaminated with arsenic and other poisons, their use is attended with danger.

The use of papers, colored with poisonous coloring, as a wrapping for candy, has long since been prohibited in France, Belgium and Switzerland, and in France the manufacturer is not only forbidden to use colored paper for this purpose, but is compelled to put his name on every package of confectionery, and is held responsible for all results that may follow its consumption. As the child is apt at any time to put the paper in its mouth, and even to swallow it, it is readily seen that poisoning might occur from this source however pure and unadulterated the candy itself.

The oils and essences with which confectionery is flavored are often of a very dangerous character, and the only reason that can

be assigned for their not being more frequently the cause of accidents and death, is the small quantity in which they are taken into the stomach at any one time. As it is, they have been known to produce the most alarming and even fatal results. What these poisons are and the methods of their manufacture will be found described in the chapter in this volume upon "Flavoring Oils and Extracts."

A large number of samples of candy were analyzed by the late Prof. Blaney, of Chicago, with a view of ascertaining the extent to which terra-alba was used as an adulterant. The results of his investigations were simply appalling. In one sample of lozenges, procured from one of the most popular confectioners of the city, he found this indigestible and therefore deleterious substance to be present to the extent of 42 per cent. In numerous other samples he found as much as 25 and even 30 per cent.

No adulterant will so effectually cheapen confectionery as this white earth, a fact which readily accounts for its very general use. While its specific gravity is greater than that of sugar it can be purchased for about one-eighth the cost of confectioner's sugar. Starch, which is also used largely for adulteration, costs more and does not supply as much weight.

CHAPTER XI.

TEAS.

"I have several lots of tea, sir, which do not exactly suit my trade. Can you fix them for me?"

"Have you samples with you?"

"Yes, sir. This is a sample of gunpowder which seems to have lost its 'facing.' Can you restore it?"

"Certainly."

"And can you heighten the color of this sample?"

"I can."

Such was the conversation held between the writer and a professional manipulator of teas in one of the Western cities.

The almost universal use of tea renders its purity, or at least its freedom from poisonous adulterants, a matter of the greatest importance. That its adulteration has been carried on to some extent in this country and is practiced upon a stupendous scale in China and Japan is a fact well understood by those who have investigated the subject. Indeed most of the adulterations in this country and in England are only in imitation of those practiced by the Chinese and Japanese themselves. The adulterations by the Chinese are fully described by Dr. Hassall* under the four following heads:

1. With foreign leaves.
2. With lie-tea.
3. With mineral substances.
4. With materials used for the coloration, painting or facing of tea.

The teas freest from admixture with foreign leaves are the better grades of black teas, while those which are most adulterated

*Hassall's "*Food and its Adulterations.*"

in this manner are the very low-priced and much broken teas, and the lower qualities of black and green gunpowder teas. Dr. Dixon, of England, writing from China, many years ago, stated that the Chinese annually dry many millions of pounds of ash, plumb, and other leaves to mix with teas. Dr. Hassall says : "The teas in which foreign leaves are liable to be met with are Congou and Souchong, but especially Twankay, gunpowder, caper and lie-tea, which latter is made up in imitation of these and other descriptions of tea, and is often used to adulterate the ordinary black teas of commerce."

Lie-tea seems to have been given its name because it is spurious and for the most part not tea at all. While it is composed in some cases in part of the dust of tea-leaves, it more frequently consists wholly of foreign leaves, sand, quartz, and magnetic oxide of iron—all these being made up with great skill and ingenuity, by means of a solution of starch, into little masses of various forms and sizes in imitation of different kinds of tea. These masses, if intended for the adulteration of ordinary black tea, as Congou, are unpainted or unfaced, but if designed to imitate caper or Shulon tea they are coated with plumbago (black lead), and if gunpowder, with Prussian blue, turmeric, China clay, or other mineral powder. Analysis has shown that these lie-teas are often composed of very large quantities of mineral matter, of which silex and magnetic oxide of iron form a considerable proportion. In 44 samples of teas analyzed by Hassall this percentage of mineral matter was found to vary as follows: In caper teas from 8.22 to 24.94 per cent., in mixed black teas from 9.51 to 12.54 per cent., in gunpowder from 8.32 to 33.49 per cent., and in mixed green teas from 13.96 to 21.83 per cent. The quantities of magnetic oxide of iron extracted by the magnet varied from 0.36 in black teas to 8.76 in green gunpowder.

The fourth kind of adulteration, the artificial coloring of teas, is resorted to to improve the appearance of certain descriptions of tea, generally the inferior qualities, for the better concealment of certain adulterations, as where foreign leaves are used, and to disguise more effectually the nature of lie-tea. Several kinds of both black and green teas are liable to be thus artificially coated or colored. The black-coated teas are those known as Scented Caper, or black gunpowder, Orange Pekoe, and the black variety of lie-tea. But it is with green teas that the practice of artificial coloration most prevails. The principal green teas thus colored are Twankay, Hyson Skin, Young Hyson, Hyson, Imperial and

Gunpowder. Nearly if not quite all these are names familiar to the American tea-drinker. "Some few years since," says Dr. Hassall, "it was impossible to meet with a Chinese green tea which was not thus artificially coated, but recently samples of uncolored green have occasionally been brought under our notice. Further the Indian green teas are almost always free from coloring material, and the Chinese tea, Oolong, which, though described as a black, is really a green tea, is equally free from coloring."

The pigmentary matters usually used in coloring or facing teas are Prussian blue, turmeric, China clay, indigo, sulphate of lime, and silicate of magnesia. These are mixed in various proportions so as to produce different shades of blue and green. The leaves are agitated with the mixture, usually in a *kuo*, or iron vessel, in which they are subjected to the action of heat, which renders them moist and flacid until they become faced or glazed, as it is termed.

Mr. Ball, writing from China of this coloring of teas, speaks of it as "a great abuse that ought to be discouraged by brokers and dealers." He also adds that it is very injurious to flavor.

As we have observed the adulterations of teas in this country have been in principle the same as those practiced in China, with this addition, viz : the working over of exhausted tea-leaves. A case of this was brought to the attention of the writer, where the exhausted leaves were collected from the hotels and restaurants and mixed with a solution of gum, catechu, and sulphate of iron to re-dye them. The gum supplied in a measure the place of the extractive matter removed from the leaves by their previous use, and the catechu and the sulphate of iron gave the solution astringency and color.

Another actual case of the wholesale doctoring of teas occurred, not many years ago, in the city of New York. A fire occurred in an extensive tea warehouse and a large stock of teas, both green and black, were so badly damaged by water and smoke as to be sold for about 6 cents per pound. Falling into the hands of an expert manipulator they were so skilfully treated as to be readily sold again at about the market price of undamaged teas.

It is a noteworthy fact that nearly all the teas exported from Japan are consumed in the United States, about two-fifths of our entire tea consumption being of the Japanese leaves. What are known in the trade as uncolored Japs, though frequently purchased for a black, are really a green tea. A variety of Japanese tea known as "basket fired" is also of quite common use and so

far as our investigation has extended is generally a strictly pure tea.

Within the past few years the adulteration and manipulation of teas in the United States would seem to have decreased in about the same ratio that the price has declined. During and immediately after the late war the high price of tea gave an unwonted incentive to fraud in this as in other lines of business, whereas at the present writing nearly all the adulteration of the teas consumed in this country takes place in China and Japan before the article is shipped.

As the detection of many of the adulterations of tea is attended with more or less difficulty, the presence of foreign leaves being discernable only with the aid of the microscope, the writer can give no better advice to those desiring to avoid imposition than this : Select those varieties which we have referred to as being most generally unadulterated. If your tea merchant is an expert, and in some measure every intelligent dealer should be, consult him and be governed by his judgment rather than by your own whim or predilection.

CHAPTER XII.

COFFEE.

If the famous wooden nutmeg has proven to the world the marvelous resources of Yankee ingenuity, the inventive genius of England has been no less indisputably established by a certain Mr. Duckworth, of Liverpool, who as early as 1850 took out a patent for moulding chicory root into the shape of coffee seeds. Under the operation of the excellent law of Great Britain, prohibiting fraud and adulteration in the manufacture and sale of articles of food, Mr. Duckworth's occupation as a coffee fabricator, has, no doubt, gone, but the memory of what he might have done for mankind, if uninterrupted by Parliament, must insure for him a prominent and permanent place among the masters of the art of imitation.

We are not aware that any American has yet succeeded in producing a substitute for the unground coffee seed. It is true, that dusty and damaged coffee is frequently subjected to a process of brushing to restore its brightness, a machine for this purpose having been contrived and patented many years ago, but nothing, we believe, is added to or taken from the seed before it is ground. The identity of the seed being once destroyed, however, the opportunities for adulteration are without limit. To such an extent has this adulteration been carried, in fact, that even the generally credulous consumer has finally been made skeptical as to the genuineness and purity of an article which is offered to him roasted, ground and ready for use at a price one-third and often one-half less than is charged for the green and unground seeds. This tacit admission of the fraud has, no doubt, done more than anything else to cause the marked decrease in the consumption of ground coffees which has taken place within the past few years.

There may be such a thing found as an unadulterated ground

coffee, but a somewhat persistent search on our part has utterly failed to discover it. The most that can be said in favor of the best samples we have examined is, that they are only a mixture of coffee and chicory. Chicory indeed is among the most common adulterants used, and, as it is really esteemed by some as imparting an improved flavor to the coffee, it is the least fraudulent. It too often occurs, however, that that which is put up and sold as a mixture of chicory, and coffee consists of little else than adulterated chicory, as chicory itself is adulterated with mangold-wurzel, parsnip, carrot, acorns and even sawdust!

To enumerate the other articles which investigation shows to be mixed with the ground coffees of the shops would require little less than a page in this volume. In the category are a countless variety of seeds, roasted peas, beans, acorns, sawdust, oak bark tan, and lastly the baked liver of both the ox and horse.

The following with reference to the use of baked horses' liver occurs in a volume, published in London several years ago, under the title of "Coffee As It Is and As It Ought to Be":

"In various parts of the metropolis are to be found liver bakers. These men take the livers of oxen and horses, bake them, and grind them into a powder, which they sell to the low-priced coffee-shop keepers at from 4d. to 6d. per pound, the horse's liver bringing the highest price."

The writer is prepared to state, from actual knowledge, that baked liver has also been used as a coffee adulterant in this country.

As the adulteration of coffee with many of the articles mentioned above has a tendency to alter and reduce the color and general appearance of the article, as well as the liquor produced with its aid, the use of artificial coloring matter is rendered necessary. For this purpose burnt sugar is sometimes used, also Venetian red and other substances.

The inability to procure coffees in the South, owing to the blockade which existed during the late war, brought into temporary use numberless substitutes, such as roasted rye, burnt sugar, okra, and dried and parched sweet potato. It is safe to say that much of the stuff offered to-day as ground coffee is little, if any, better than these Southern substitutes.

In view of the foregoing facts, about the only sensible advice the writer can give his readers with regard to purchasing ground coffee is, "Don't do it."

CHAPTER XIII.

COCOA AND CHOCOLATE.

The authorities give the following description of the cocoa tree:

"It is a small but handsome tree, indigenous to the West Indies and Central America. 'It grows spontaneously in Mexico and on the coast of Caraccas, and forms whole forests in Demerara. It is cultivated also in the Mauritius and in the French island of Bourbon.'

"The seeds or beans are enclosed in a pod or fruit somewhat like that of a cucumber, being usually about five inches long, and three and a half in diameter. Each fruit contains in general from twenty to thirty beans, disposed in five rows, which are divided from each other by partitions. Occupying the divisions of the fruit and surrounding the seeds is a rose-colored spongy substance, resembling that of water-melons.

"The above description applies to fruits of average size; sometimes the fruits are so large, especially those grown in Central America, that they contain as many as from forty to fifty seeds; while others, as those grown in the West India Islands, Berbice, and Demerara, are much smaller, and enclose only from six to fifteen seeds.

"During maturation the fruits change from green to dark yellow; they are then plucked, opened, the seeds cleared of the spongy substance, and spread out to dry in the air.

"In the West Indies, immediately that they are dried, the beans are packed up and are ready for the market; but in the Caraccas they are subjected to slight fermentation; for this purpose they are either put into chests or tubs, which are covered over with boards, the beans being turned over every morning to equalize the fermentation, or else they are put into pits or trenches dug in the earth. Lastly, they are exposed to the sun and dried.

"During the process the beans emit a good deal of moisture, lose weight, as well as part of their bitterness and acrimony.

"The seeds which have undergone the process of fermentation are considered the best; they are larger, of a darker brown color, and after roasting, throw off their husks readily, and split easily into several pieces or lobes. They have an agreeable mildly bitter taste, without acrimony.

"The beans of Guiana and West India cocoas, while they are smaller, flatter, smoother, and of a lighter color, are also more sharp and bitter to the taste. 'They answer best for the attraction of the butter of cocoa, but afford a less aromatic and agreeable chocolate.'

"Previous to being used, the beans are roasted in an apparatus similar to that of a coffee-roaster. When the aroma is well developed the roasting is known to be finished. The beans are turned out, cooled, and freed from their outer husks by fanning and sifting, the inner shell-like husk remaining unbroken. By the roasting, part of the starch is converted into dextrin, and a little of the fat into fatty acids.

"Cocoa has been in use in Mexico from time immemorial. It was introduced into Europe by the Spaniards in 1520, and by them it was long kept a secret from the rest of the world."

We are told that as a nutritive cocoa stands very much higher than either tea or coffee in consequence of the larger quantities of starch, gluten and fat contained in it. The consumption of cocoa in our own country, is very small as compared with that of either tea or coffee. It is sufficiently used, however, to justify our giving attention to the subject of its purity.

The article of chocolate, which is of more common use with us, is a mixture of cocoa with other substances.

Very much of the prepared cocoa and chocolate consumed by us is put up and manufactured in Europe and particularly in France, where its adulteration occurs. There are several large establishments devoted to their manufacture, however, in this country, the products of which we have found to vary in character all the way from the best to the most inferior samples of the foreign article.

From the English works of Mitchell and Normandy, we learn the following with reference to the adulterations practiced in that country and in France.

Mitchell says:

"Chocolate is adulterated with flour, potato starch, and sugar,

together with cocoa-nut oil, lard, or even tallow. Even the so-called finest chocolate is made up with clarified mutton suet and common sugar, together with ordinary cocoa.

"If in breaking chocolate it is gravelly—if it melt in the mouth without leaving a cool, refreshing taste—if it, on the addition of hot water, becomes thick and pasty—and, lastly, if it form a gelatinous mass on cooling, it is adulterated with starch and such-like substances.

"Where earthy and other solid substances are deposited from chocolate mixed with water, either the beans have not been well cleansed, inferior sugar has been employed, or mineral substances have been added to it, either for the purpose of coloring or of increasing its weight.

"Moreover, when chocolate has a kind of cheesy taste, animal fat has been added; and when very rancid, either vegetable oil, or even the seeds themselves, have been employed in the sophistication.

"The mineral substances employed in the making up of chocolate are some of the ochres, both red and yellow, together with minium (red lead), vermilion, sulphate of lime, chalk, etc. Chocolates so adulterated, more especially with the preparations of lead, are highly injurious; it is, however, only the inferior chocolates that are thus adulterated."

Normandy, who had thoroughly investigated the subjected, wrote as follows:

"Unfortunately, however, many of the preparations of the cocoa-nut sold under the names of chocolate, of cocoa flakes, and of chocolate powder, consist of a most disgusting mixture of bad or musty cocoa-nuts, with their shells, coarse sugar of the very lowest quality, ground with potato starch, old sea-biscuits, coarse branny flour, animal fat (generally tallow), or even greaves. I have known cocoa powder made of potato starch, moistened with a decoction of cocoa-nut shells, and sweetened with treacle; chocolate made of the same materials, with the additions of tallow and of ochre. I have also met with chocolate in which brick-dust or red ochre had been introduced to the extent of 12 per cent.; another sample contained 22 per cent. of peroxide of iron, the rest being starch, cocoa-nuts with their shells, and tallow. Messrs. Jules Garnier and Harel assert that cinnabar and red lead have been found in certain samples of chocolate, and that serious accidents had been caused by that diabolical adulteration. Genuine chocolate is of a dark brown color; that which has been adulter-

ated is generally redder, though this brighter hue is sometimes given to excellent chocolate, especially in Spain, by means of a little annatto. This addition is unobjectionable, provided the annatto is pure, which, however, is not always the case."

CHAPTER XIV.

MEATS.

The subject of food adulteration naturally leads to the consideration of unwholesome and diseased meats, and perhaps in no other article that comes to the table is greater care requisite than in the selection of proper animal food.

In nearly all large cities the system of abattoirs and municipal inspection prevents the offering for sale of meat that is known to be diseased or positively injurious to the public health, but officials are too often lax in performing their duties, and there are always plenty of meat venders who do not scruple to sell anything that will return a good profit, no matter how filthy or unwholesome it may be.

In all sound flesh the muscles should be firm and elastic, pale for the young animals and darker for the old ones. A deep purple color is good evidence that the animal died without being bled; such meat is, of course, unfit for food. Diseased meat can usually be detected by the unpleasant odor, also by the wet, flabby and sodden appearance, the fat, in the language of Letheby, "looking like jelly or wet parchment." The condition of the lungs, the liver and the spleen affords the most conclusive proof to the inspector of the presence of disease in the animal, but the consumer of course has no opportunity for making such an examination. The marrow in the leg-bones should be of a light, rosy red color for twenty-four hours after killing. If the marrow is soft, brownish in color, or if it shows black points, the animal has been sick and putrefaction has commenced.

The microscope is particularly valuable in examining meats, as it reveals the presence of any parasites and shows whether the texture of the muscles has been changed by decomposition or disease.

It is a well-established fact, that the flesh of animals, although not diseased, may nevertheless be poisonous by reason of some poisonous food taken by the animal previous to being killed. Birds, fed on a certain species of berry, become poisonous, yet the birds seem as active and healthy as ever, and nothing can be detected in the flesh. So we have numerous instances of severe and even fatal sickness from eating flesh of cattle or hogs, when no trace of actual poison could be discovered.

When cattle are overdriven or worried or bruised, the animals become feverish and the meat is diseased and unwholesome in consequence.

Professor Lamgee, speaking of the maladies of cattle, says:— "Many of the worst forms of disease are very sudden and only slightly affect the color and texture of the muscular apparatus. A fine fat bullock, with florid meat, may have died from splenic apoplexy, or been merely killed *pro forma*, when already on the point of death. Remove the spleen and the carcass appears sound. Yet, dogs and pigs die from eating any portion of such cattle."

Morand, in his "*Histoire d'une Maladie tres-singulaiere*," says: "If the blood or raw flesh of any overdriven animal be applied to a scratch, or on the unbroken skin of a human being, a dangerous and often fatal inflammation is excited." He has not witnessed such an affect where this flesh has been cooked and eaten. Still we should not feel safe in trying the experiment. An eruption of gangrenous boils (*postulus malignes* of the French) is often present in these cases, and it is by no means improbable that the fatal results which have been attributed to the mere handling of the flesh where there was no abrasion of the skin, were due to the use of it as food.

The large packing establishments are obliged to exercise the greatest care in selecting animals for slaughtering, as in the rush of killing and cutting up the carcasses, the workmen are often very careless. We have positive evidence that in some instances in the packing houses, the knife has laid open an ugly abcess or a malignant postule in the flesh, and the workmen proceeded without the slightest pause or the least effort to remove the injured portion. The plea urged in such cases by the men, is, that it takes too much time to trim out the bad portion.

It is very true that salt is a great purifyer and antiseptic, and that it neutralizes many injurious things, otherwise such careless workmen would have much to answer for in the way of disease and death amongst the unfortunate consumers.

The most fruitful source of danger to public health, however, is from meats in which the process of decay has been allowed to commence.

Christison, one of the leading authorities on this point, says: "Naturally wholesome or harmless animal matters may become instant poisons through the ordinary process of putrefaction; the mere commencement of decay is sufficient to render meat poisonous to those unaccustomed to its use." The same writer in his work on poisons, says: "Game, or other meat, only decayed enough to please the palate of the epicure, has caused severe cholera in those unaccustomed to its use." The usual symptoms in such cases of poisoning are shivering, giddiness, headache, burning fever, diarrhœa and vomiting; sometimes these symptoms are accompanied by delirium, a fetid salivation and ulcer of the mouth. In very severe cases, collapse, involuntary stools, and great prostration precedes death. On dissection, the alimentary mucus membrane has been found softened and the intestinal follicles ulcerated.

It has been well said that the human stomach is long suffering and that it will adapt itself to almost any kind of imposition. By constant and increasing doses, quantities of deadly poisons, such as arsenic or opium may be taken with impunity, which would be sufficient to kill a dozen persons who had not undergone such previous training. So it is that epicures can feast without danger on game or meats, tainted to such an extent as to be absolutely poisonous to a novice in this particular department of gastronomy. Some tribes of savages go even further and rather enjoy rancid oil, putrid blubber and stinking offal. The Digger Indians, as is well known, relish very much a dish made up of the putrid entrails of animals. The fact remains, however, that to the ordinary mortal tainted meat is unwholesome and must be resolutely guarded against.

Where the meat to be pickled or cured is not allowed to thoroughly cool off before being subjected to the curing process, the worst results are very apt to follow. The natural or animal heat should entirely disappear before the flesh is handled.

From the foregoing it will be understood that the duties of the health officers are by no means light, and it is only by the exercise of the utmost vigilance that the sale of such dangerous meats is prohibited. Indeed, few people have any adequate idea of the amount of this meat that is daily condemned to the rendering tanks or the fertilizer factories in all our large cities.

CHAPTER XV.

CANNED MEAT.

The business of putting up canned and cooked meats, ready for immediate consumption, has greatly increased during the past few years, owing principally to the improved methods adopted, which have resulted in a steadily growing demand for these canned goods. They now occupy an important position in our export trade, as well as being largely consumed at home, and their convenience and economy are universally recognized.

Some of the largest meat canning establishments in the world are located in Chicago, and personal observation at these places warrants us in saying that there are no grounds for complaint on the score of adulteration or injury to the public health. Acting on the sound business maxim that success can only be assured by maintaining a high standard, the proprietors of these establishments seem to be scrupulously careful in every detail.

For the cooked corned beef the best grass fed cattle are slaughtered, all swill fed, diseased, bruised or emaciated animals being rejected. The same care is exercised also in cutting up and cooking the meat. Nothing is allowed to remain that would in any way affect the quality of the product.

The process while a very simple one, requires the exercise of the greatest care and watchfulness. After cooking, the meat is pressed into the cans and the cans soldered up. It is then treated in the cans with a steam bath to ensure even a more thorough cooking, and at the same time to expel the air through a small hole left open in the cans. When removed from the steam bath the cans are at once hermetically closed and the contents will remain unchanged for an indefinite period.

No flavoring or coloring matter is used, the salt being deemed all sufficient. The unvarying excellence of the meat so packed has given these Chicago establishments a world-wide reputation and their trade is something enormous.

It is not to be supposed, however, that the successful firms would have no imitators, and from such imitators we may expect inferior goods. Meat-canning establishments have sprung up at various points throughout the country, and some of them are managed with an almost criminal carelessness.

In towns where there are no public abattoirs and no meat inspectors, the killing as a rule is done in a reckless manner, and the meat is often improperly handled. Diseased and tainted meat also, is no doubt often placed in the cooking kettles, the salt, and sometimes an addition of soda being depended upon for covering up all suspicions of the putrid portions.

The improper and insufficient cooking is another evil. In some instances it has been found that meat had not been cooked enough to preserve it, and it became putrid in the cans.

The occasional cases of poisoning reported from eating prepared beef no doubt could be traced to such causes. Instances have also come to light where a lot of inferior meat has been treated with coloring matter of a very questionable nature for the purpose of improving appearances.

The meat cans themselves demand a share of attention. Some houses are induced by a false economy, to use the cheapest grades of tin, which, as has been shown elsewhere, are largely coated with lead. It has been argued that this lead is responsible for sickness which has sometimes followed the eating of prepared meats. This, however, can hardly be possible. In putting up the meat, salt and saltpetre are the only substances generally used. The salt is chemically *chloride of sodium* and the saltpetre is *nitrate of potash*. If either the chlorine or the nitric acid were free they would quickly combine with the lead and form a poisonous salt, but in both cases they are already combined with their strongest bases. The chemical affinity of chlorine for sodium is very much stronger than for lead, and therefore the salt does not act on the lead even when it is present. For the same reason saltpetre does not combine with the lead.

The main objection to the use of the cheap qualities of tin would seem to be that the tin is liable to crack in working, and so make it almost impossible to secure the perfect hermetric sealing of the cans necessary for the preservation of the meat, therefore,

in order to secure the best grades of tin plates, the proprietors of the great and pioneer canning establishment at Chicago, place their specifications in the hands of the manufacturers in Great Britain, and rigidly require of them that none but the very best metals be furnished.

In the manufacture of cans, it has been the custom with most manufacturers, to make use of resin and various acids in soldering and sealing them. While not absolutely injurious, this process is not free from grave objections, and we have observed that here also the larger Chicago packers have demonstrated their desire and ability to maintain the high reputation that their goods have obtained throughout the world, by avoiding the use of either resin or any acid in the manufacture and sealing of their cans. They use as a flux, for soldering, palm oil.

CHAPTER XVI.

VINEGAR.

It is primarily proper to observe with regard to vinegar that there is none so wholesome, or free from elements deleterious to health, as that which is made from fruit, either the apple or the grape. Apple-cider vinegar is the better known and more generally consumed of the two in our own country, the pure acid product of the grape being so rarely met with that it is hardly worthy of mention in these pages.

The ingenuity which has manifested itself in supplying a cheap substitute for an adulteration of nearly every article that goes upon the table is by no means lacking among the manufacturers of this most common condiment and preservative.

The substitutes for fruit-vinegars, compounds which are usually placed upon the market as "pure cider vinegar" or "white wine vinegar," should be divided into two classes, the one coming under the head of *inferior*, while the other is deserving of no milder designation than *poisonous*. The latter no less than the former is largely sold for table use, as well as for manufacturing pickles.

The vinegars which we have classed as simply inferior to the fruit vinegars, are the result of the acidification or oxidation, which takes place in passing a solution of distilled spirit (generally highwines) and water, in the proportion relatively of about ten and ninety parts, through wood shavings, birch twigs, corn cobs or other substances. These are generally known to the trade as highwine vinegars and when properly manufactured and untampered with beyond the addition of coloring, which is usually burnt sugar, they cannot be regarded as other than harmless and wholesome. The coloring is usually added when it is desired to represent them to the consumer as cider vinegar. When they are

sold as white wine vinegar, the addition of the coloring is unnecessary.

Formerly the spirit used in the manufacture of this class of vinegar (and its production then was comparatively light) was procured from the distilleries. A recent act of Congress, however, has permitted the vinegar-maker to produce a low wine direct from the grain, and most of the larger manufacturers have availed themselves of this privilege, so that this class of vinegar has come to be manufactured in much larger quantities. It has also come to be called "new process vinegar."

The substitution of glucose or grape sugar for the distilled spirit is extensively practiced by manufacturers to produce another and a cheaper grade of vinegar than the above. And it is to this latter class, particularly, that mineral acids are often added and in quantities which render them dangerous. It is this class of vinegars, in fact, which in their adulterated forms we have seen fit to designate poisonous, and which under a proper sanitary law, would be so labeled.

Muriatic or hydro-chloric acid is the more frequent adulterant, though in our own investigations and in the analyses made by Dr. Williams, we have found also sulphuric acid.

The manufacturer is allowed, under the English law, to add one one-thousandth part of sulphuric acid to his vinegar, though Dr. Hassall condemns the introduction of even this small quantity.

Another danger to be apprehended from the careless manufacture of vinegar is contamination with the poisonous metals, and particularly copper. This is apt to occur from the action of the acid upon the copper vessels used in the process of manufacturing.

Out of twenty-four samples of vinegar recently analyzed by the Health Department of Chicago, one sample was found to be so strongly impregnated with copper, that the prevention of its sale was recommended.

In a recent letter to Mr. Geo. T. Angell, of Boston, Prof. Geo. A. Marriner says: "I have in several cases found sugar of lead in vinegar. I use no vinegar myself. I look with suspicion upon our vinegar. I use fruit acids in place of it,—lemon-juice, etc."

CHAPTER XVII.

PICKLES.

The facts presented in the preceding chapter furnish sufficient reason for our regarding with suspicion most of the vegetable substances preserved by the antiseptic power of vinegar. Not only is a pure vinegar the very first essential to the preparation of a wholesome pickle, but our observation would lead us to believe that the evil effects so frequently charged to the indigestible pickle, are in very many cases chargable rather to the impurities and poisons in the vinegar in which it is preserved. Other poisons however are frequently added in the process of pickle making, and notably *copper*. By the aid of this pernicious metal the manufacturer imparts to the vegetables a fixed and pleasing green which renders them so attractive to the eye and tempting to the palate of the thoughtless. We say of the thoughtless, since a moment's reflection must suggest the fact that the color is an unnatural one and must be imparted by artificial means. The cucumber is never so green upon the vine as we have seen it in the bottle and upon our pickle plates.

The use of copper as a coloring matter for pickles would seem, indeed, to have found its origin in the household before its adoption in the factories, and its use is even suggested in most of the cook-books. Dr. Accum, of England, in his celebrated work, "Death in the Pot," takes occasion to observe that numerous fatal consequences are known to have ensued from the eating of pickles "to which the fresh and pleasing hue had been imparted according to the deadly *formulae* laid down in modern cookery books, such as boiling the pickle with halfpence (copper coin) or suffering them to stand for a considerable period in brazen vessels."

Among other similar recipes, Dr. Hassall also takes occasion to particularly condemn the following:

"*To pickle gherkins.*—Boil the vinegar in a bell-metal or copper pot ; pour it boiling hot on your cucumbers.

"*To make greening.*—Take a bit of verdigris the bigness of a hazelnut, finely powdered, half a pint of distilled vinegar, and a bit of alum powder, with a little bay salt. Put all in a bottle, shake it and let it stand till clear. Put a small teaspoonful into codlings, or whatever you wish to green."

It is entirely within bounds to say that not one of the very green cucumber pickles found in the grocery shops is free from copper, while the amount of the metal present is frequently so great as to be absolutely dangerous. Dr. Percival, in "Medical Transactions," gives the case of a young lady who ate freely pickles thus impregnated with copper. She soon complained of pain in the stomach, and in five days vomiting commenced which was incessant for two days. After this her stomach became prodigiously distended, and in nine days after eating the pickles she died.

In the preceding chapter we have shown the frequency with which sulphuric acid is found in vinegars of the cheaper grades, grades that are most frequently used in the pickle factories. Add to this dangerous acid the copper for coloring, and there is straightway formed *sulphate of copper.*

A wholesale druggist of Chicago admitted to the writer that he had for some time been selling verdigris to a pickle manufacturer in large quantities without suspecting the use to which it was being applied. He finally learned that it was employed for coloring, though not until after his own family had consumed several jars of the identical pickles.

In conversation with an extensive manufacturer the danger attending the use of copper was referred to by us. He admitted all that we urged against the use of the pernicious metal, and added that he had abandoned it altogether and was selling an uncolored pickle only. "But," he continued, "the green pickles are much more attractive to the eye and therefore more salable. You see that I state on all my labels : 'These pickles contain no poisonous greening,' and if I can only educate the consumer to understand that the only wholesome pickles are those that are uncolored I shall be satisfied."

Fourteen samples of pickles purchased promiscuously from the grocery shops were analyzed by us with the following results:

In nine cases out of the fourteen the vinegar was more or less impregnated with mineral acid.

In thirteen out of the fourteen samples copper was discovered in quantities varying from a small to a highly dangerous amount.

The one sample in which no trace of copper was found was a bottle of gherkins which were of a yellowish rather than a green hue.

In two samples *sulphate of copper* was found in poisonous amounts.

The article of chow-chow the dressing for which is often most foully adulterated, is referred to in the chapter on spices and sauces.

CHAPTER XVIII.

SPICES, SAUCES, ETC.

The variety of articles comprehended under the general head of condiments are so numerous that only a brief mention of each, and the fraud and adulteration practiced in their manufacture and preparation, can be made within the limits of a single chapter. Suffice it to observe in a general way, that it is very difficult to procure from the spice mill or the sauce maker an article that is unmixed with foreign substances, or that is really what the label represents it to be. Dr. Piper, a well-known analyst and microscopist, of Chicago, recently had occasion to examine a sample of ground black pepper in which he found of pepper itself barely five per cent., the remaining ninety-five parts consisting of fibres of wood with a very slight admixture of cayenne to give it strength, and the whole ingeniously colored to imitate the appearance of the spice.

If the excellent provision of the English law, requiring the manufacturer to print upon the label the true contents of the package, could be enforced in our own country, there is probably no branch of business which would be more completely revolutionized than that of the spice manufacturer.

Mustard.—The most common adulterations of mustard are with wheat flour and turmeric, the first named to give bulk and the latter to restore the color. Forty-two samples purchased from London shops were analyzed by Dr. Hassall, all of which were found to be adulterated with flour and turmeric. Among other adulterants used, both in this country and in England, are cayenne pepper, ginger, charloch, ground rice, clay, chromate of lead, and yellow ochre. One sample analyzed by us was found to contain flour to the amount of about 60 per cent., with cayenne pepper to impart pungency and yellow ochre for coloring.

A sample analyzed by Dr. Williams was found to contain, 50 per cent. of mustard, 30 per cent. of starch, 15 per cent. of terra alba and 5 per cent. of cayenne.

One sample analyzed by us, which was labeled "Double Superfine," was found to be composed of a fine grade of mustard, with about ten per cent. of wheat flour. When used upon the table, we can hardly say that such mustard is other than it should be, the small addition of flour being necessary to modify the harshness of the pure ground seed, which would otherwise be too strong for the ordinary consumer. When sold in the drugstores, however, to be used in the sick room for plasters, where its full strength is desired, the addition of any substance calculated to weaken it must be regarded in the light of an adulterant and condemned.

Black Pepper.—This article is more or less adulterated with linseed meal, mustard husks, wheat flour or middlings—both of wheat and buckwheat—pea flour, sago, rice, broken crackers or cracker dust, pepper dust, and a variety of woody fibre. Dr. Accum also mentions common clay. When the strength is destroyed by these adulterants, cayenne is used to restore it.

Cayenne or Red Pepper.—As Dr. Hassall very correctly observes, cayenne is subjected to even more extensive adulterations than ordinary black pepper. Among the more common adulterants may be enumerated mineral coloring matters, such as red lead, red ochre, and vermilion, Venetian red, or sulphate of mercury, ground rice, turmeric, salt, husks of white mustard seed, and even sawdust, particularly of such woods as mahogany. Both colic and paralysis have been produced by the use of cayenne containing red lead. Says Dr. Hassall: "The salts of lead and mercury are characterized by the circumstance that they are apt to accumulate in the system, and so to produce symptoms of a very serious nature. Thus, no matter how small the quantity of mercury or lead introduced each day, the system is slowly and insidiously brought under the influence of these poisons. The quantity of red lead introduced into the system in adulterated cayenne, is, however, *by no means inconsiderable.*"

Out of ten samples of cayenne analyzed by us, eight were found to be adulterated with starch and wheat middlings, and colored with Venetian red.

Ginger.—In addition to being often rubbed over with lime or chalk, or bleached by means of a solution of chloride of lime or by exposure to the fumes of burning sulphur, ginger has been

found to be adulterated with sago meal, potato flour, wheat flour, cayenne pepper, mustard husks and turmeric powder.

Cinnamon.—A deception, closely bordering on a fraud, is almost constantly practiced, in the sale of cassia bark for cinnamon. While the cassia belongs to the same genus or family of plants as cinnamon, it is very different from cinnamon in many respects. The detection of the difference between the two is very simple if they have not been ground. As to these distinctions, Hassall observes: "The bark of cinnamon is scarcely thicker than drawing-paper and breaks with an uneven and fibrous margin; while each stick consists of eight, ten, or more pieces or quills of bark inserted one within the other. Cassia bark is much stouter, being often as thick as a shilling; it breaks short and without splintering. But these barks differ also in color and taste. Cinnamon is paler and browner than cassia, which is usually red and bright. The taste of one is sweet, mild, and aromatic, leaving no unpleasant impression on the tongue, while that of the other is less sweet, stronger, and is followed by a bitterness."

We have found ground cinnamon very often to be simply ground cassia. We have also found other adulterants quite commonly used. In the samples submitted by us to Dr. Williams, he reports finding "little cinnamon, much cassia and considerable starch."

Nutmegs.—Not having encountered the historical wooden nutmeg in our researches, we are not prepared to state authoritatively that the nutmeg is ever imitated or adulterated in this country Such would not seem to be the case, however, the world over.

According to Rheede, the Turkish and Jewish merchants utilize the flavorless and odorless wild nutmegs of the *Myristica Malabarica* by mixing them with, and selling them for the cultivated nutmeg.

Mr. Chevallieu also observes :

"Nutmegs are sometimes mixed with riddled nuts, eaten by insects, and become brittle; the small apertures are then closed with a kind of cement, formed of flour, oil, and powder of nutmeg. This paste has even served to fabricate false nutmegs, inodorous and insipid. The workmen of Marseilles have even made them of bran, clay, and the refuse of nutmegs; these nutmegs, placed in contact with water, softens down in that liquid."

Cloves.—As cloves are seldom if ever ground, we may simply pass them by with the remark that they are seldom if ever adulterated.

Sauces.—With regard to the countless counterfeits of English sauces, such as the Worcestershire, we have only to observe that they are generally cheap if not vile compounds, which are sometimes put up in imitation bottles and under false labels, but more frequently sold in bulk to the restaurants and larger consumers, at a very low figure. The majority of them are little more than sweetened and colored water, cheaply flavored, and possessing very little strength. In lieu of serving as a relish, they more frequently impair the palatableness of the dish to which they are added. While they are the grossest kind of a fraud, we are not prepared to say that they contain any ingredient absolutely detrimental to health.

Tomato and Other Catsups.—We have found the cheaper tomato catsups met with in the grocery shops, to be frequently composed of other vegetable substances than the tomato, cheaply spiced and colored to imitate that vegetable. Pumpkin is one of these substitutes, and also the pulp of apples, and we have likewise reason to believe that the character of pulp referred to as the base of the cheaper grades of apple butter is sometimes made use of. The very low price at which these catsups are often retailed would seem to sufficiently indicate their true value and virtue.

A better grade of catsup we have found put up at the larger fruit and vegetable packing establishments, where the waste portions of the tomato, removed in the process of peeling the vegetable, is utilized to excellent advantage. The peeling itself, however, is sometimes cut up very finely, and finds its way into the catsup.

The lightly consumed article of walnut catsup can be and is often produced without the aid of the walnut, in which case it is, to say the least of it, a vile fraud.

The dressing used by the pickle manufacturers in preparing chow-chow is frequently a villainous compound of cheap ingredients. In lieu of olive oil a very inferior substitute is often used, the character of which is disguised by the mustard. Flour is added in considerable quantities, and in some cases foreign coloring matter is employed.

CHAPTER XIX.

CANNED FISH AND GAME.

The business of canning the products of the ocean, as well as several of the Northern lakes, has, within the past few years, developed into immense proportions, and the goods thus prepared are not only consumed in great quantities all over our own country, but very largely exported. An interesting volume might be written upon this industry alone. Not only are the oysters of the coast supplied in the shell, as well as in cans and kegs to the most remote internal points accessible by railroad, but fresh salmon and other salt water luxuries are packed so as to keep for an indefinite period of time, and even to bear shipment to the most distant foreign lands. Of the salmon packed on the Pacific coast, a very large portion is put up expressly for exportation.

This business, like that of packing cooked meats, is, we believe, generally conducted honestly. The price of the canned oyster generally determines the size and character of the oyster, as well as the relative proportions of meat and water in the can. The leading houses in the trade have adopted a specified quantity of oysters for each size can, and such cans are known as "standard filled." Cheap cans contain more water and less oysters.

In certain sections of the country, and particularly in the South, cove oysters are largely consumed, and in packing these water is sometimes used to an extent that would seem as incredible as it is fraudulent. Our information upon this subject is derived from a member of one of the largest packing firms in the East.

The cans which are often retailed as low as ten cents each are known to the trade as "slack filled." In filling these cans only three ounces of the oyster meat is used to every two pounds of water. However small the oysters, when packed with this pro-

portion of water, there can be but very few in the can. And yet quantities of this barely flavored liquor are sold throughout the Southern States, particularly to the negroes, who are, no doubt, attracted by its cheapness.

The same process of watering could be applied also to other articles. The representative of an extensive salmon packing concern in California informs us, that he has often been urged by his customers to furnish a "slack-filled" salmon can—one that could be retailed at a profit for about ten cents—with the assurance that quantities could be sold at that price. It is only just to state that the salmon-packers, despite these solicitations, have thus far abstained from cheapening their goods by the addition of water.

The packing of salmon has grown to be a very important interest, particularly on the Pacific coast and the leading houses are careful to maintain the reputation of their goods. Lately, some of the irresponsible firms have made a practice of putting up what are called white salmon, a fish that is in every respect inferior to the regular red salmon, and which costs less than half as much as the latter. These white salmon cans are put up in such a way as to easily deceive the unwary purchaser.

The canning of cooked fowls, and also game, in its season, is carried on to some extent at certain points in the West. Of the game thus packed the most common is the prairie-chicken, the quail, the grouse and the rabbit. As in the case of most of the other descriptions of canned meats the larger portion of these goods are packed for exportation.

We have had the opportunity of visiting several of the establishments where this business is carried on, and we could discover nothing to condemn, either in the character or quality of the material selected or the process of preparing and packing it. We can readily see, however, how quite the opposite might be the case without arousing a suspicion on the part of the distant consumer.

CHAPTER XX.

WINES AND LIQUORS.

The well-known adulteration of liquors and the manufacture of imitation wines has been so thoroughly exposed in the daily journals and periodical publications of the country, that the writer does not deem it necessary to discuss the subject in its details in these pages.

The use of inferior wines and liquors in cooking and for flavoring is no less a mistake than the use of the same articles upon the table or at the side-board. The vicious compounds, whose only recommendation is their cheapness, which are so often used in the kitchen when they would be rejected in the parlor, are no less injurious to health when taken into the stomach in food than when they are taken from the glass. It is altogether too common a thing for families to purchase two qualities of liquors, and frequently from two distinct classes of dealers, the one to be used as a beverage and the other "only for cooking."

As in the case of many articles of food, about the only test of quality is to be found in the price, the cheaper always being inferior and generally unfit for use for any purpose. Let the purchaser who pays $2.00 per gallon for Cognac brandy, even for cooking, but bear in mind that the duty imposed by the Government upon brandies imported from the Cognac region is $2 per proof gallon, and he or she may be able to form an idea of what has been purchased under a French label.

The skill of the compounder has been carried to such a point that there is scarcely a well-known brand of foreign wine which has not been imitated and in many cases so successfully as to deceive any one not an expert.

The writer regrets being compelled to state from actual knowledge that no class of dealers is more frequently or grossly im-

posed upon by the compounder of spurious liquors than the druggist, and when it is borne in mind, that these liquors frequently find their way into the sick-room, the consequences of the imposition become appalling.

We have said that the adulterations of liquors have already been sufficiently exposed to require no more than a passing mention in these pages. We may state that there are but few wholesale houses in which there is not employed an expert compounder, whose duty it is to prepare French brandies out of American corn spirits, Holland gins with the aid of juniper oil, Irish and Scotch whiskies with creosote, and so on through the whole list of liquors.

The same artist can produce in his laboratory, with equal ease and in an incredibly short time, whiskies of any age that the customer may demand and is willing to pay for—the basis of these goods invariably being highwines or rectified spirit which, when it is of the very best quality, rarely costs more than 20 cents per gallon above the Government tax.

A whisky, however pure its ingredients or carefully manufactured, is really not fit to be used until it has passed at least three summers – or in other words is three years old. And yet fully three-fourths of the spirit sold as old and ripe whisky has never been matured, and contains the fusel oil in its crudest state. Prune juice and other patent agents are often employed for artificially ageing whisky.

The articles used in adulterating and imitating wines are almost numberless. They include artificial coloring matters, logwood, ratany root, elderberries, bilberries, tannin, alum, cider, lime, lead and copper. As Dr. Wight, of Milwaukee, truly observes: "Dealers, and even 'bar-tenders,' have books in which recipes are given for making imitations of all kinds of wines."

Distilled spirit is added to these cheaper compounds to arrest or prevent fermentation, which is known to the trade as "fortifying."

CHAPTER XXI.

BEER AND ALE.

The very general use into which bottled beer has come within the past few years in families, where it is not infrequently proscribed by the physician, together with the constantly increasing consumption of the beverage in public drinking places, lead us to give it our attention as an article susceptible of gross adulteration. If, indeed, beer has or is likely to become a national beverage with us, as is claimed by the advocates of its use, its purity and wholesomeness become questions worthy of consideration.

A strictly pure beer of prime quality should be made exclusively from barley malt and hops. Corn, however, has come to be very generally used by American brewers, and also rice. When the last named grain enters into its manufacture, it is known as Pilsner beer. Neither corn nor rice can be said to contain anything especially delcterious, though their use detracts from the quality of the beer. The great difference discovered in the products of different breweries, is more frequently attributable to the quality of materials used than to the methods of brewing.

There are other articles than corn and rice, however, many of them cheap and vicious substitutes for the wholesome bitter of hops, which are more or less used by unscrupulous brewers.

The first schedule of the British Licensing Act, gives the following list of prohibited deleterious ingredients used in the adulteration of beer: Cocculus indicus, common salt, opium, Indian hemp, strychnine, tobacco, darnel seed, extract of logwood, salts of zinc or lead, and alum.

The use of tobacco or the seeds of cocculus indicus gives intoxicating power; burnt sugar or licorice impart color; quassia, aloes (both of which are substitutes for hops), and coriander and caraway seeds increase the flavor; and cayenne pepper and com-

mon salt give pungency and create thirst. Soda is very generally added to beer by American brewers to impart life and create foam. A Chicago brewer informed the writer that out of several hundred customers among the saloon men, only two demanded a beer free from soda; in explanation of which he added: "There is more money for the retailer in a keg of beer charged with soda; he sells more foam and less beer."

Dr. Parks, of England, gives as adulterants of beer, also, lime, sulphate of iron and sulphuric acid, the latter being used to clarify and give the hard flavor of age. It is proper here to observe, however, that the word *beer* as referred to in the English law and works of English authors who have treated upon adulterations, is used in its generic sense and has reference to ale and stout rather than to what we understand to be beer or lager beer. Very many of the adulterants of English ales, however, analysis has shown are used by the American brewers of beer. Dr. Piper, in his investigations and analyses, has found tobacco to be often used—one of the most deleterious and repulsive adulterants in the whole category.

Personal investigation by the writer has disclosed the very general use of glucose, and occasionally the use of glycerine also

The bottled beers are generally subjected to a heating or steaming process after corking, to preclude fermentation, and permit their being kept for a long period and shipped to various climates, as is frequently the case.

To detect the presence of many of the adulterants we have named would require the skill of the practical chemist.

CHAPTER XXII.

AERATED AND MINERAL WATERS.

In the preceding chapter reference has been made to the imitation of foreign wines. The same observations will apply to the fabrication of the better known and more extensively advertised mineral and medicinal waters. It would seem that no sooner is a public demand established for a meritorious foreign spring product, such, for instance, as the Apollinaris or Hunyadi Janos waters or the Friedrichshall Bitter-water, than some imitator, regardless of proprietary rights and fearless of trade-mark laws, places upon the market a spurious article, yet so closely resembling the genuine in all the external appearances of bottle, label and corking, as to thoroughly deceive and defraud the purchaser. The contents of these deceptive bottles are, of course, little more than salted water, charged, perhaps, with carbonic-acid gas, and utterly devoid of the medicinal properties for which they were purchased. Those who engage in this business are generally the mineral water, or "pop" manufacturers of the larger cities, in whose establishments are produced with equal ease and audacity foreign ginger ales, champagnes made from apple-cider, and countless other abominations that are supplied in great quantities to the saloons for a trifle over the cost of bottling and delivering.

This is a class of fraud which should by no means be overlooked in framing a comprehensive national law for the protection of the public against imposition and adulteration.

The word soda water, as applied to the gaseous water served with flavored syrups at the drug-stores and elsewhere in all the larger cities, has come to be a misnomer. This gas (carbonic acid) is generally generated simply by the aid of sulphuric acid and

marble dust. At one time a certain quantity of carbonate of soda was added, whence the name, but this soda is now entirely omitted.

The syrups into which these waters are drawn are in some few instances produced from the fruit itself, but we have much more frequently found them to be simply a chemical compound—simple syrup, colored and flavored with artificial and frequently dangerous flavoring extracts. Of the character of these fruitless fruit extracts, we take occasion to speak in another chapter.

CHAPTER XXIII.

FLAVORING OILS AND EXTRACTS.

As these flavoring preparations enter largely into food, as well as confectionery, soda water syrups, etc., we cannot overlook them, and a chapter devoted to the consideration of their purity and the processes of their manufacture must be read with interest.

The true oils of orange, clove, etc., are obtained by two methods, expression and distillation, chiefly by the latter; and we are compelled to state at the very outset that these oils are very frequently adulterated or diluted by additions of olive oil and also cotton-seed oil.

A true essence of lemon, orange, etc., should be made from the fruit itself, but the very large proportion of the fruit extracts represented as true, are produced from the oils we have above described, simply by the addition of alcohol. The extracts of lemon, orange, bitter almond, rose, cloves, cinnamon, mace, nutmeg, thyme and sweet marjoram, can all be made in this manner. The extracts of vanilla, coriander, ginger and celery, are produced by mascerating the respective substances in dilute alcohol.

If the above extracts or those produced either direct from fruit or spice or from the oils of fruit or spice were all that we encounter in our chemical researches, we might let the subject drop here. That they are not all, nor more than a very small part of the so-called fruit and spice extracts will be directly shown.

The United States Dispensary, pp. 1596, informs us that "several of the compound ethers have been found to possess the odor and flavor of certain fruits, a property which has led to their employment as flavoring materials for confectionery, and desserts, under the name of fruit essences."

The extent to which these compound ethers are used as the basis of fruit essences is enormous, and the Dispensary does well to observe that "it is important that the materials should be pure, *especially the fusel oil* and the alcohol."

How very few, even in this enlightened age, and with the pages of the Dispensary open to them, are aware of the fact that the delicate flavors of the banana or the strawberry that delight the palate in drinking the refreshing soda water, or dissolving in the mouth the cool creams and ices, are flavors derived from the refuse oil and poison of the stillhouse, instead of from the wholesome fruit.

The chemist, Kletzinski, has furnished the manufacturer with a table giving the ingredients and the proportions of the same to be used in preparing these false and fraudulent extracts. His formula is as follows for pine-apple, strawberry, raspberry and peach essences :

Essence of Pine-apple.—To 100 parts of alcohol add 1 part of chloroform, 1 part of aldehyde. 10 parts butyrate of amyl and 3 parts of glycerine.

Strawberry Essence.—To 100 parts of alcohol add 1 part nitric ether, 5 parts acetate of ethyl, 1 part of formiate of ethyl, 5 parts butyrate of ethyl, 1 part salicylate of methyl, 3 parts acetate of amyl, 2 parts butyrate of amyl and 2 parts of glycerine.

Raspberry Essence.—To 100 parts of alcohol add 1 part nitric ether, 1 part aldehyde, 5 parts acetate ethyl, 1 part formiate of ethyl, 5 parts of butyrate of ethyl, 1 part benzoate of ethyl, 1 part œnanthylate of ethyl, 1 part sebacic ether, 1 part salicilate of methyl, 1 part acetate of amyl, 1 part butyrate of amyl, 5 parts tartaric acid, 1 part succinic acid, 1 part benzoic acid.

Peach Essence.—To 100 parts of alcohol add 2 parts of aldehyde, 5 parts acetate of ethyl, 5 parts formiate of ethyl, 5 parts butyrate of ethyl, 5 parts valerianate of ethyl, 5 parts œnanthylate of ethyl, 1 part sebacic ethyl, 2 parts salicylate of methyl and 5 parts of glycerine.

From different combinations of the same ethers are also produced the essences of gooseberry, mellon, grape, apple, orange, lemon, pear, black cherry, plum, apricot, quince and banana.

To illustrate the extent to which the chemical production of these false flavoring agents may be carried, we can state that Dr. T. D. Williams has succeeded in producing a very deceptive pine-apple essence (?) from the refuse obtained from the sewer of a Chicago fertilizer manufactory.

It is hardly necessary to observe that many of the compound ethers used in the mauufacture of essences are poisonous, and the reason of there being so few serious results to chronicle from their use, is, owing only to the fact that they are taken into the stomach in such small quantities.

CHAPTER XXIV.

TINNED FRUITS AND VEGETABLES.

There is scarcely a perishable product of the garden which is not packed so as to keep from one season to another—this packing being generally in tin vessels. Packing fruits in this manner has also very largely superseded their being preserved as formerly.

Though the use of foreign and dangerous substances to impart color, as copper to give a green hue to peas and greengage plumbs, is noticed by writers upon the subject, as having occurred in Europe, we are pleased to state that our own investigations have utterly failed to detect any such practice in this country.

The only possibility of the vegetables thus packed becoming contaminated or rendered unwholesome, is from the action of the acid they supply upon the tin vessels in which they are packed, and whether this occurs to such an extent as to argue against their use as food, we very much doubt. The great quantities of these vegetables consumed and the very rare reports of even suspected accidents, would naturally lead to the conclusion that they are both a wholesome and a safe article of diet.

The action of different fruit acids upon the metals may be attended with very different results. Several cases of suspected metallic poisoning were reported a few years ago from the use of canned pieplant, since which time the canning of this vegetable has been almost entirely given up. The tomato, on the other hand, which is more extensively consumed than any of the canned vegetables, has never, we believe, been suspected.

As in the case of canned oysters, an undue amount of water is sometimes added to certain canned fruits and vegetables by the

packers, simply to cheapen them. This practice is simply fraudulent without being, in any sense, harmful.

To avoid accidents resulting from the metallic contamination of vegetables, the packers cannot exercise too much care in the selection of their tin, to see that it is unadulterated with lead, which yields much more readily to the action of the acids and produces a much more poisonous salt. Care should also be exercised in the manufacture of the cans to see that no more solder is used than is absolutely necessary, as in this manner lead may be easily introduced.

CHAPTER XXV.

ADULTERATIONS OTHER THAN THOSE OF FOOD.

Having considered the adulterations of food in the preceding chapters, the author would carry his investigations to other articles of every day use in the household, in all of which, more or less deception is practiced by unscrupulous manufacturers and frequently with the knowledge and aid of equally unscrupulous dealers. While in many cases the only loss suffered by the consumers from these impositions is that of the money expended, in other cases the much more serious loss of health is involved.

SOAP.

The ingredients made use of by the manufacturers of cheap and adulterated soap to give it weight or solidity, or to increase its cleansing and bleaching qualities, which latter is always accomplished at the expense of the article washed, are almost numberless. In the category may be enumerated pipe-clay, soap-stone, talc, silex, muriate of tin, glauber salts, silicate of soda, starch and resin. With the possible exception of the two last mentioned all of these ingredients either give a fraudulent weight to the soap, or are detrimental to the fabric subjected to contact with them. If resin is not used in too great quantities it does not injuriously affect the quality, but with this single exception there is no one of the nine articles which is either a necessary or an honest element in any cleansing compound placed upon the market.

And does the reader ask what proportion of the soaps ordinarily offered for sale are thus adulterated? Upon the testimony of the manufacturers themselves we are compelled to answer, fully one-half, if not more. Nor are we prepared to blame the manufacturer wholly for this fraud. The willingness, almost the desire of the consumer to be humbugged, the demand for the fullest weight

for the least money, and for an article to save labor rather than linen, has done much to stimulate and encourage the manufacture of chemical and loaded soaps. An extensive manufacturer was candid enough to confess to the writer that he had been compelled to turn out a spurious as well as a pure article, in order to meet the demands of the trade, "though," he added, " we are careful to see that it does not go out under our name or be mistaken for our pure productions." In the article of soap, as in many articles of food to which we have referred, the heaviest is not always the cheapest, nor what seems the cheapest the most economical.

With reference to what are known as toilet soaps it may surprise the reader to learn that their ingredients are identically the same as the soaps of the laundry, the only difference being that the former are colored and perfumed. But in connection with the soaps of the toilet we are compelled to speak of another evil; viz., the use in their manufacture of impure animal fat and its effects upon health.

A prominent physician of Philadelphia, regarding it a duty to investigate this matter, recently made a series of analyses and experiments which led him to declare that no process of purging ordinarly adopted by the manufacturer using diseased animal fat was sufficient to remove the organic poisons, or render the soap containing them other than dangerous and detrimental to health when daily applied to the porous surfaces of the body. Aside, too, from its positive injurious effects there is something repulsive even in the thought of our performing our daily ablutions with the aid of an article so noxious in itself, however disguised by the coloring and scenting of the soapmaker's art.

Regarding the almost countless washing fluids offered as substitutes for soap, the writer is only able to say that he has failed to find even one the base of which is not soda ash, which must render them all more or less destructive of the fabric cleansed with their aid.

BEESWAX.

Beeswax is largely adulterated with cerasine, paraffine and tallow. The presence of tallow can be detected both by the taste and smell. If it is adulterated with either of the former articles, it may be detected by chewing it; if it is thus adulterated, it will act like gum ; if pure, it will not make anything like gum, but will crumble to pieces in the mouth. These are the more modern methods of adulterating wax. It was formerly accomplished with

earth, meal, resin, etc. The first two render it brittle and grayish and may be detected by melting the wax.

The impurities can be strained out. Resin makes the fracture, when the wax is broken, smooth and shining instead of granular. The resin may be dissolved in cold alcohol, while the wax remains untouched.

STARCH.

While starch itself is used as an adulterant in many articles, as in the article of soap, it is in turn also adulterated, though not to the same extent that it was done a few years ago, when corn was higher than at present and competition in quality was less sharp. The only adulterant we have found is lime, and this in very small quantity.

The article of food, known as corn starch, we have found to be free from adulteration, though greatly varying in quality.

POISONOUS COSMETICS.

There are very few of the so-called hair restorations, complexion powders, etc., which are not more or less dangerous. In a recent paper, Prof. Geo. A. Marriner, of Chicago, remarks: "I would like to add that I have analyzed numerous samples of cosmetics and powders used on the face and hair. Almost all the hair cosmetics, including most of those in common use, I have found to be very poisonous, and many of the face powders and preparations I have found to contain arsenic or lead. I should not be surprised if 20,000 people in Chicago to-day were injuring their health and endangering their lives by the use of these cosmetics and powders."

ARSENICAL POISONING.

Upon this subject we quote at length from an able and interesting paper, read by Mr. Geo. T. Angell, of Boston, before the American Social Science Association, at its last session at Saratoga, New York:

"The amount of arsenic imported into this country during the year ending June 30, 1875, was two million, three hundred and twenty-seven thousand, seven hundred and forty-two pounds (2,327,742). Each pound contained a fatal dose for about 2,800 adult human beings. It is sold in our markets almost as freely as wood and coal, at a wholesale price of from a cent and a half to two cents a pound.

"What becomes of it?"

"I answer it is used in wall papers, paper curtains, lamp

shades, boxes. wrapping papers for confectionery, tickets, cards, children's kindergarten papers, artificial flowers, dried grasses, eye-shades and numerous other articles. Among the articles frequently made dangerous by this or other poisons may be named also ladies' dress goods, veils, sewing silks, threads, stockings, gentlemen's underclothing, socks, gloves, hat-linings, linings of boots and shoes, paper collars, babies' carriages, colored enamelled cloths, children's toys, various fabrics of wool, silk, cotton and leather in various colors. Arsenic has been found also in toilet powders and candles. Professor Nichols, of our Massachusetts Institute of Technology, found eight grains of arsenic to each square foot of a dress. Another chemist found ten grains of arsenic in a single artificial flower. A child in Troy, N. Y., some time since, died in convulsions by taking arsenic from a veil thrown over its crib to keep off flies.

"A case has been recently brought to my knowledge of a Boston gentleman so severely poisoned by wearing poisonous underclothing that for several days he could hardly see. Possibly the largest use of arsenic is in the preparation of our wall papers. The Massachusetts State Board of Health, in their report for 1872, gave twenty-five pages to this subject. These poisonous papers are of a great variety of colors—green, blue, red, yellow, pearl and other colors. Some are cheap, some costly, some figured, some plain, some glazed, some unglazed. There is but one way of surely detecting them, and that is by chemical analysis. It has been estimated that full three-quarters of all our wall papers now manufactured contain arsenic. The Michigan State Board of Health has recently published a book containing seventy-five representative specimens of these papers, and by order of that Board it has been put into every important public library of Michigan, as a warning to the people of that State. It bears the very appropriate title of 'Shadows from the Walls of Death.' This book states that these papers are sold in every city and important village of that State, and that their use is increasing. It advises (1st) to use no wall paper at all; (2d) never to use wall paper without first having it tested for arsenic; and (3d), if arsenical paper is already on the walls, and cannot well be removed, then [as some protection] to cover it with a coat of varnish.

"There can be no doubt that thousands of people in this country are now suffering, and many have died, from the effects of arsenical wall papers. Yet their manufacture and sale are permitted to go on without restriction. 'When I was in Germany,'

said an eminent Boston chemist to me, 'I discovered arsenic in *two* specimens of wall paper, and the manufacturer was in jail before night. Here I have analyzed hundreds of specimens in a single year, and found arsenic in a large proportion of them, but nobody was prosecuted.' "

ADULTERATED TINWARE.

The following from the Boston *Journal of Chemistry* may be read with interest and profit:

" Attention has recently been called to a new risk of chronic poisoning by the old enemy, lead. What we call tin vessels are in daily use in every household in the land. They are cheap, durable and convenient, and have been considered perfectly safe for the thousand culinary purposes to which they are devoted. They are safe if the tin plate is honestly made. But, unfortunately, this is not always to be counted upon. Tin is comparatively cheap, but lead is cheaper, and an alloy of the two metals may be used in place of the dearer one with profit to the manufacturer.

" The alloy is readily acted upon by acids, and salts of lead are thus introduced into food. The Michigan State Board of Health has latety been investigating this subject, having been led to do so by a letter from a physician who found that certain cases of what had been taken for chorea were really paralysis agitans, which could be traced to this kind of lead poison. Other cases were brought to light in which children had died of meningitis, fits and paralytic affections, caused by milk kept in such vessels, the acid in the fluid having dissolved the lead. Malic, citric and other fruit acids are, of course, quicker and more energetic in their action upon the pernicious alloy. The danger is the greater because the lead salts are cumulative poisons. The effect of one or two small doses may not be perceptible, but infinitesimal doses, continually repeated, will in the end prove injurious, if not fatal. Analysis of a large number of specimens of tin plate used in culinary articles showed the presence of an alloy with lead in almost every instance, and often in large quantities. *It is safe to assert that a large proportion of the tin wares in the market are unfit for use on this account.*"

In the same article also occurs the following : " It is stated by Dr. Kedzie [who is not only president of the Michigan State Board of Health, but an eminent chemist], that a peculiar kind of tin plate, the coating of which is largely made up of lead, is coming into general use for roofing, eaves-troughs and conductors, and it is suggested that much of this lead will eventually be dissolved

and find its way into household cisterns. Susceptible persons may be poisoned even by washing in this lead-charged water, and all who drink it, even after it is filtered, are in danger of chronic lead poisoning."

And in a subsequent edition this :

"Dr. Emil Querner, of Philadelphia, writes us that since we called attention to the subject he has tested a great number of tin vessels from different sources with nitric acid and a solution of iodide of potassium, *and found lead in every case.*" He adds : "All my vessels for cooking, etc., are now made of sheet iron, and give entire satisfaction."

MARBLEIZED IRONWARE.

The wares which will be recognized by the above heading, and which have come largely into use within the past few years, are deserving of attention. While they are very attractive to the eye they are also very dangerous. A chemist of Harvard University, who recently analyzed a number of samples, declared them to be "alive with poison." Arsenic is used very largely in their manufacture.

CHAPTER XXVI.

TRICHINA.

The frequent infection of the flesh of certain animals used for food, and particularly the hog, with the parasitic worm known as Trichina, warrants our reproducing the following description of the origin, development and characteristics of these minute enemies of health and life, by Dr. O. W. Wight, Commissioner of Health, of Milwaukee, in his annual report for the year 1879:

"No animal," says Professor Van Beneden, of Louvain, "at any time has attracted so much attention as that little worm which lives in flesh, rolled up; it is about the size of a millet seed, and was found by chance in the dissecting-room of a London hospital, in 1832. Let us imagine an extremely slender pin, rolled upon itself in a spiral form so as to lodge in a cavity hollowed out in the midst of the muscles, in a space not larger than a grain of millet. Professor R. Owen gave them the name of *Trichina*, because they are thin as a hair; he added the specific name of *spiralis* on account of the manner in which they were rolled up in their cyst. *Trichina spiralis* is therefore the name of this animal.

"The trichinæ, which are now completely known in the minutest details of organization and manner of life, have a distinct mouth, and they have a complete digestive tube with an orifice at each end of the body, like all worms in the form of a thread. Besides this nutritive apparatus, trichinæ, like nematodes in general, have the sexes divided into distinct individuals, so that there are males and females, which can be easily distinguished from each other by the form and size of the body.

"Trichinæ are found in the flesh of almost all the mamals. If we eat this trichinous flesh, the worms become free in the stomach

as digestion goes on, and they are developed with extreme rapidity. Each female lays a prodigious number of eggs; from each of these comes a microscopic worm, which bores through the walls of the stomach or intestines, and thousands lodge themselves in the flesh, where they hide till they are again introduced into another stomach."

With this general description by Professor Van Beneden in mind, let us follow the migration of the little viper from the flesh of a pig into the flesh of man. A piece of raw or half cooked pork, containing encysted trichinæ, is eaten. In the stomach the cysts are digested enough to set the worms free. It would take twenty-eight of them placed end to end to measure an inch in length. It would take 600 of them laid side by side to measure an inch in width. After being set free they pass from the stomach into the intestines and uncoil themselves. Then they grow very rapidly and develop their sexual character. When grown it would take only from seven to nine of them placed end to end to measure an inch. A great number of eggs in the females are developed into embryos. Birth is given to a myriad of little trichinæ, so small that it would take from 120 to 140 of them placed end to end to measure an inch. The enterprising little rascals bore their way through the intestines and travel to every part of the body. And when they have selected and pre-empted a homestead they coil themselves up and each one separately builds about itself a house or cyst. Here they wait, years it may be, for some other animal to devour the flesh in which they are buried, when they, too, may be set free and enjoy a brief honey-moon, like their progenitors.

The disease caused by the migration of the little trichinæ from the intestines to the muscular parts of the body, and by their growth, is dreadful, and very often fatal. It resembles typhoid fever, with swelling and intense pain of the muscles. Death usually takes place in the fourth week. The worms have then done traveling, are developed and encysted. If the patients survive that period, they may live on for years, but they are pretty densely populated with worms. In a pound of human flesh, Leuckart found 700,000 trichinæ. In a cubic inch, 80,000 have been counted. It has been estimated that as many as 250 millions may exist in a single pig.

Trichinæ are very tenacious of life. Death of the animal which they inhabit does not destroy them. Complete decomposition of meat filled with them does not extinguish the vital spark of their existence. Freezing does them no harm. According to Kuechenmeister, ordinary smoking of meat does not disturb tri-

chinæ. The corpse of a pig infected with them may be entombed in a pork-barrel, with plenty of salt, and the worms will survive. The carcass of an animal peopled with trichinæ may be "imprisoned in thick-ribbed ice," may "lie in cold obstruction, and rot," without disturbing its encysted denizens. There is something sublime, even poetic, in the long, dumb expectancy of these little creatures, in their solitary and silent hope of a resurrection in the blood-warm stomach of some unknown animal, there to realize the Mohammedan glories of a new and fruitful life.

The only convenient thing that will kill them is a dose of fire. Man usually receives trichinæ from pork. According to Fiedler, a temperature of 155° Fahr., will destroy free trichinæ, but the encapsuled trichinæ requires greater heat. I should advise giving them a climate of about 300°. Nothing but the thorough cooking of pork can make it safe food for man. If it cuts red and rare, like beef, on the table, it should be avoided with determination.

There have been grave epidemics of trichinosis in Germany and the United States. The disease has probably been more frequent than hitherto observed. Swine fed on garbage and offal are much more likely to be infected than those fed on the wholesome products of farms.

CHAPTER XXVII.

THE ENGLISH LAW.

The following is the Adulteration of Food and Drugs Act of Great Britain:

WHEREAS it is desirable that the Acts now in force relating to the adulteration of food should be repealed, and that the law regarding the sale of food and drugs in a pure and genuine condition should be amended:

Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. From the commencement of this Act the statutes of the twenty-third and twenty-fourth Victoria, chapter eighty-four, of the thirty-first and thirty-second of Victoria, chapter one hundred and twenty-one, section twenty-four, of the thirty-third and thirty-fourth of Victoria, chapter twenty-six, section three, and of the thirty-fifth and thirty-sixth of Victoria, chapter seventy-four, shall be repealed, except in regard to any appointment made under them and not then determined, and in regard to any offence committed against them or any prosecution or other act commenced and not concluded or completed, and any payment of money then due in respect of any provision thereof.

2. The term 'food' shall include every article used for food or drink by man, other than drugs or water:

The term 'drug' shall include medicine for internal or external use:

The term 'county' shall include every county, riding, and

division, as well as every county of a city or town not being a borough:

The term 'justices' shall include any police and stipendiary magistrate invested with the powers of a justice of the peace in England, and any divisional justices in Ireland.

Description of Offences.

3. No person shall mix, colour, stain, or powder, or order or permit any other person to mix, colour, stain, or powder, any article of food with any ingredient or material so as to render the article injurious to health, with intent that the same may be sold in that state, and no person shall sell any such article so mixed, coloured, stained, or powdered, under a penalty in each case not exceeding fifty pounds for the first offence; every offence, after a conviction for a first offence, shall be a misdemeanour, for which the person, on conviction, shall be imprisoned for a period not exceeding six months with hard labour.

4. No person shall, except for the purpose of compounding as hereinafter described, mix, colour, stain, or powder, or order or permit any other person to mix, colour, stain, or powder, any drug with any ingredient or material so as to affect injuriously the quality or potency of such drug, with intent that the same may be sold in that state, and no person shall sell any such drug so mixed, coloured, stained, or powdered, under the same penalty in each case respectively as in the preceding section for a first and subsequent offence.

5. Provided that no person shall be liable to be convicted under either of the two last foregoing sections of this Act in respect of the sale of any article of food, or of any drug, if he shows to the satisfaction of the justice or court before whom he is charged that he did not know of the article of food or drug sold by him being so mixed, coloured, stained, or powdered as in either of those sections mentioned, and that he could not with reasonable diligence have obtained that knowledge.

6. No person shall sell to the prejudice of the purchaser any article of food or any drug which is not of the nature, substance, and quality of the article demanded by such purchaser, under a penalty not exceeding twenty pounds; provided that an offence shall not be deemed to be committed under this section in the following classes: that is to say,

(1.) Where any matter or ingredient not injurious to health has been added to the food or drug because the same is required for the production or preparation thereof as an

article of commerce, in a state fit for carriage or consumption, and not fraudulently to increase the bulk, weight, or measure of the food or drug, or conceal the inferior quality thereof;

(2.) Where the drug or food is a proprietary medicine, or is the subject of a patent in force, and is supplied in the state required by the specification of the patent:

(3.) Where the food or drug is compounded as in this Act mentioned;

(4.) Where the food or drug is unavoidably mixed with some extraneous matter in the process of collection or preparation.

7. No person shall sell any compound articles of food or compounded drug which is not composed of ingredients in accordance with the demand of the purchaser, under a penalty not exceeding twenty pounds.

8. Provided that no person shall be guilty of any such offence as aforesaid in respect of the sale of an article of food or a drug mixed with any matter or ingredient not injurious to health, and not intended fraudulently to increase its bulk, weight, or measure, or conceal its inferior quality, if at the time of delivering such article or drug he shall supply to the person receiving the same a notice, by a label distinctly and legibly written or printed on or with the article or drug to the effect that the same is mixed.

9. No person shall with the intent that the same may be sold in its altered state without notice, abstract from an article of food any part of it so as to affect injuriously its quality, substance, or nature, and no person shall sell any articles so altered without making disclosure of the alteration, under a penalty in each case not exceeding twenty pounds.

Appointment and Duties of Analysts, and Proceedings to obtain Analysis.

10. In the city of London and the liberties thereof the Commissioners of Sewers of the city of London and the liberties thereof, and in all other parts of the metropolis the vestries and district boards acting in execution of the Act for the better local management of the metropolis, the court of quarter sessions of every county, and the town council of every borough having a separate court of quarter sessions, or having under any general or local Act of Parliament or otherwise a separate police establishment, may, as soon as convenient after the passing of the Act,

where no appointment has been hitherto made, and in all cases as and when vacancies in the office occur, or when required so to do by the Local Government Board, shall, for their respective city, districts, counties, or boroughs, appoint one or more persons possessing competent knowledge, skill, and experience, as analysts of all articles of food and drugs sold within the said city, metropolitan districts, counties, or boroughs, and shall pay to such analysts such remuneration as shall be mutually agreed upon, and may remove him or them as they shall deem proper; but such appointments and removals shall at all times be subject to the approval of the Local Government Board, who may require satisfactory proof of competency to be supplied to them, and may give their approval absolutely or with modifications as to the period of the appointment and removal, or otherwise: Provided, that no person shall hereafter be appointed an analyst for any place under this section who shall be engaged directly or indirectly in any trade or business connected with the sale of food or drugs in such place.

In Scotland the like powers shall be conferred and the like duties shall be imposed upon the commissioners of supply at their ordinary meetings for counties, and the commissioners or boards of police, or where there are no such commissioners or boards, upon the town councils for boroughs within their several jurisdictions; provided that one of Her Majesty's Principal Secretaries of State in Scotland shall be substituted for the Local Government Board of England.

In Ireland the like powers and duties shall be conferred and imposed respectively upon the grand jury of every county and town council of every borough; provided that the Local Government Board of Ireland shall be substituted for the Local Government Board of England.

11. The town council of any borough may agree that the analyst appointed by any neighboring borough or for the county in which the borough is situated, shall act for their borough during such time as the said council shall think proper, and shall make due provision for the payment of his remuneration, and if such analyst shall consent, he shall during such time be the analyst for such borough for the purposes of this Act.

12. Any purchaser of an article of food or of a drug in any place being a district, county, city, or borough where there is any analyst appointed under this or any Act hereby repealed shall be entitled, on payment to such analyst of a sum not exceeding ten shillings and sixpence, or if there be no such analyst then acting

for such place, to the analyst of another place, of such sum as may be agreed upon between such person and the analyst, to have such article analysed by such analyst, and to receive from him a certificate of the result of his analysis.

13. Any medical officer of health, inspector of nuisances, or inspector of weights and measures, or any inspector of a market, or any police constable under the direction and at the cost of the local authority appointing such officer, inspector, or constable, or charged with the execution of this Act, may procure any sample of food or drugs, and if he suspect the same to have been sold to him contrary to any provision of this Act, shall submit the same to be analysed by the analyst of the district or place for which he acts, or if there be no such analyst then acting for such place, to the analyst of another place, and such analyst shall, upon receiving payment as is provided in the last section, with all convenient speed analyse the same and give a certificate to such officer, wherein he shall specify the result of the analysis.

14. The person purchasing any article with the intention of submitting the same to analysis shall, after the purchase shall have been completed, forthwith notify to the seller or his agent selling the article his intention to have the same analysed by the public analyst, and shall offer to divide the article into three parts to be then and there separated, and each part to be marked and sealed or fastened up in such manner as its nature will permit, and shall, if required to do so, proceed accordingly, and shall deliver one of the parts to the seller or his agent.

He shall afterwards retain one of the said parts for future comparison and submit the third part, if he deems it right to have the article analysed to the analyst.

15. If the seller or his agent do not accept the offer of the purchaser to divide the article purchased in his presence, the analyst receiving the article for analysis shall divide the same into two parts, and shall seal or fasten up one of those parts and shall cause it to be delivered, either upon receipt of the sample or when he supplies his certificate to the purchaser, who shall retain the same for production in case proceedings shall afterwards be taken in the matter.

16. If the analyst do not reside within two miles of the residence of the person requiring the article to be analysed, such article may be forwarded to the analyst through the post office as a registered letter, subject to any regulations which the Postmaster General may make in reference to the carrying and delivery of

such article, and the charge for the postage of such article shall be deemed one of the charges of this Act or of the prosecution, as the case may be.

17. If any such officer, inspector, or constable, as above described, shall apply to purchase any article of food or any drug exposed to sale, or on sale by retail on any premises or in any shop or stores, and shall tender the price for the quantity which he shall require for the purpose of analysis, not being more than shall be reasonably requisite, and the person exposing the same for sale shall refuse to sell the same to such officer, inspector, or constable, such person shall be liable to a penalty not exceeding ten pounds.

18. The certificate of the analysis shall be in the form set forth in the schedule hereto, or to the like effect.

19. Every analyst appointed under any Act hereby repealed or this Act shall report quarterly to the authority appointing him the number of articles analysed by him under this Act during the foregoing quarter, and shall specify the result of each analysis and the sum paid to him in respect thereof, and such report shall be presented at the next meeting of the authority appointing such analyst, and every such authority shall annually transmit to the Local Government Board, at such time and in such form as the Board shall direct, a certified copy of such quarterly report.

Proceedings against Offenders.

20. When the analyst having analysed any article shall have given his certificate of the result, from which it may appear that an offence against some one of the provisions of this Act has been committed, the person causing the analysis to be made may take proceedings for the recovery of the penalty herein imposed for such offense, before any justice in petty sessions assembled having jurisdiction in the place where the article or drug sold was actually delivered to the purchaser, in a summary manner.

Every penalty imposed by this Act shall be recovered in England in the manner described by the eleventh and twelfth of Victoria, chapter forty-three. In Ireland such penalties and proceedings shall be recoverable, and may be taken with respect to the police district of Dublin metropolis, subject and according to the provisions of any Act regulating the powers and duties of justices of the peace for such district, or of the police of such district; and with respect to other parts of Ireland, before a justice or justices of the peace sitting in petty sessions, and subject and ac-

cording to the provisions of 'The Petty Sessions (Ireland) Act, 1851,' and any Act amending the same.

Every penalty herein imposed may be reduced or mitigated according to the judgment of the justices.

21. At the hearing of the information in such proceeding the production of the certificate of the analyst shall be sufficient evidence of the facts therein stated, unless the defendant shall require that the analyst shall be called as a witness, and the parts of the articles retained by the person who purchased the article shall be produced, and the defendant may, if he think fit, tender himself and his wife to be examined on his behalf, and he or she shall, if he so desire, be examined accordingly.

22. The justices before whom any complaint may be made, or the court before whom any appeal may be heard, under this Act may, upon the request of either party, in their discretion cause any article of food or drug to be sent to the Commissioners of Inland Revenue, who shall thereupon direct the chemical officers of their department at Somerset House to make the analysis, and give a certificate to such justices of the result of the analysis; and the expense of such analysis shall be paid by the complainant or the defendant as the justices may by order direct.

23. Any person who has been convicted of any offence punishable by any Act hereby repealed or by this Act by any justices may appeal in England to the next general or quarter sessions of the peace which shall be held for the city, county, town, or place, wherein such conviction shall have been made, provided that such person enter into a recognizance within three days next after such conviction, with two sufficient sureties, conditioned to try such appeal, and to be forthcoming to abide the judgment and determination of the court at such general or quarter sessions, and to pay such costs as shall be by such court awarded; and the justices before whom such conviction shall be had are hereby empowered and required to take such recognizance; and the court at such general or quarter sessions are hereby required to hear and determine the matter of such appeal, and may award such costs to the party appealing or appealed against, as they or he shall think proper.

In Ireland any person who has been convicted of any offence punishable by this Act may appeal to the next court of quarter sessions to be held in the same division of the county where the conviction shall be made by any justice or justices in any petty sessions district, or to the recorder at his next sessions where the

conviction shall be made by the divisional justices in the police district of Dublin metropolis, or to the recorder of any corporate or borough town when the conviction shall be made by any justice or justices in such corporate or borough town (unless when any such session shall commence within ten days from the date of any such conviction, in which case, if the appellant sees fit, the appeal may be made to the next succeeding sessions to be held for such division or town), and it shall be lawful for such court of quarter sessions or recorder (as the case may be) to decide such appeal, if made in such form and manner and with such notices as are required by the said Petty Sessions Acts respectively hereinbefore mentioned as to appeals against orders made by justices at petty sessions, and all the provisions of the said Petty Sessions Acts respectively as to making appeals and as to executing the orders made on appeal, or the original orders where the appeals shall not be duly prosecuted, shall also apply to any appeal made under this Act.

24. In any prosecution under this Act, where the fact of an article having been sold in a mixed state has been proved, if the defendant shall desire to rely upon any exception or provision contained in this Act, it shall be incumbent upon him to prove the same.

25. If the defendant in any prosecution under this Act prove to the satisfaction of the justices or court that he had purchased the article in question as the same in nature, substance, and quality as that demanded of him by the prosecutor, and with a written warranty to that effect, that he had no reason to believe at the time when he sold it that the article was otherwise, and that he sold it in the same state as when he purchased it, he shall be discharged from the prosecution, but shall be liable to pay the costs incurred by the prosecutor, unless he shall have given due notice to him that he will rely on the above defense.

26. Every penalty imposed and recovered under this Act shall be paid in the case of a prosecution by any officer, inspector, or constable of the authority who shall have appointed an analyst or agreed to the acting of an analyst within their district, to such officer, inspector, or constable, and shall be by him paid to the authority for whom he acts, and be applied towards the expenses of executing this Act, any Statute to the contrary notwithstanding; but in the case of any other prosecution the same shall be paid and applied in England according to the law regulating the application of penalties for offences punishable in a summary

manner, and in Ireland in the manner directed by the Fines Act, Ireland, 1851, and the Acts amending the same.

27. Any person who shall forge, or shall utter, knowing it to be forged for the purposes of this Act, any certificate or any writing purporting to contain a warranty, shall be guilty of a misdemeanour and be punishable on conviction by imprisonment for a term of not exceeding two years with hard labour;

Every person who shall wilfully apply to an article of food, or a drug, in any proceedings under this Act, a certificate or warranty given in relation to any other article or drug, shall be guilty of an offence under this Act, and be liable to a penalty not exceeding twenty pounds;

Every person who shall give a false warranty in writing to any purchaser in respect of an article of food or a drug sold by him as principal or agent, shall be guilty of an offence under this Act, and be liable to a penalty not exceeding twenty pounds;

And every person who shall wilfully give a label with any article sold by him which shall falsely describe the article sold, shall be guilty of an offence under this Act, and be liable to a penalty not exceeding twenty pounds.

28. Nothing in this Act contained shall affect the power of proceeding by indictment, or take away any other remedy against any offender under this Act, or in any way interfere with contracts and bargains between individuals, and the rights and remedies belonging thereto.

Provided that in any action brought by any person for a breach of contract on the sale of any article of food or of any drug, such person may recover alone or in addition to any other damages recoverable by him the amount of any penalty in which he may have been convicted under this Act, together with the costs paid by him upon such conviction and those incurred by him in and about his defence thereto, if he prove that the article or drug the subject of such conviction was sold to him as and for an article or drug of the same nature, substance, and quality as that which was demanded of him, and that he purchased it not knowing it to be otherwise, and afterwards sold it in the same state in which he purchased it; the defendant in such action being nevertheless at liberty to prove that the conviction was wrongful, or that the amount of costs awarded or claimed was unreasonable.

Expenses of Executing the Act.

29. The expenses of executing this Act shall be borne, in the city of London and the liberties thereof, by the consolidated rates

raised by the Commissioners of Sewers of the city of London and the liberties thereof, and in the rest of the metropolis by any rates or funds applicable to the purposes of the Act for the better local management of the metropolis, and otherwise as regards England, in counties by the county rate, and in boroughs by the borough fund or rate;

And as regards Ireland, in counties by the grand jury cess, and in boroughs by the borough fund or rate; all such expenses payable in any county out of grand jury cess shall be paid by the treasurer of such county; and

The grand jury of any such county shall, at any assizes at which it is proved that any such expenses have been incurred or paid without previous application to presentment sessions, present to be raised off and paid by such county the moneys required to defray the same.

Special Provision as to Tea.

30. From and after the first day of January one thousand eight hundred and seventy-six all tea imported as merchandise into and landed at any port in Great Britain or Ireland shall be subject to examination by persons to be appointed by the Commissioners of Customs, subject to the approval of the Treasury, for the inspection and analysis thereof, for which purpose samples may, when deemed necessary by such inspectors, be taken and with all convenient speed be examined by the analysts to be so appointed; and if upon such analysis the same shall be found to be mixed with other substances or exhausted tea, the same shall not be delivered unless with the sanction of the said commissioners, and on such terms and conditions as they shall see fit to direct, either for home consumption or for use as ships' stores or for exportation; but if on such inspection and analysis it shall appear that such tea is in the opinion of the analyst unfit for human food, the same shall be forfeited and destroyed or otherwise disposed of in such manner as the said commissioners may direct.

31. Tea to which the term 'exhausted' is applied in this Act shall mean and include any tea which has been deprived of its proper quality, strength, or virtue by steeping, infusion, decoction, or other means.

32. For the purposes of this Act every liberty of a cinque port not comprised within the jurisdiction of a borough shall be part of the county in which it is situated, and subject to the jurisdiction of the justices of such county.

33. In the application of this Act to Scotland the following provisions shall have effect:

1. The term 'misdemeanour' shall mean 'a crime or offence;'
2. The term 'defendant' shall mean 'defender' and include 'respondent;'
3. The term 'information' shall include 'complaint;'
4. This Act shall be read and construed as if for the term 'justices,' wherever it occurs therein, the term 'sheriff' were substituted:
5. The term 'sheriff' shall include 'sheriff substitute;'
6. The term 'borough' shall mean any royal burgh and any burgh returning or contributing to return a member to Parliament;
7. The expenses of executing this Act shall be borne in Scotland, in counties, by the county general assessment, and in burghs, by the police assessment;
8. This Act shall be read and construed as if for the expression 'the Local Government Board,' wherever it occurs therein, the expression 'one of Her Majesty's Principal Secretaries of State' were substituted;
9. All penalties provided by this Act to be recovered in a summary manner shall be recovered before the sheriff of the county in the sheriff court, or at the option of the person seeking to recover the same in the police court, in any place where a sheriff officiates as a police magistrate under the provisions of 'The Summary Procedure Act, 1864,' or of the Police Act in force for the time in any place in which a sheriff officiates as aforesaid, and all the jurisdiction, powers, and authorities necessary for this purpose are hereby conferred on sheriffs;

   Every such penalty may be recovered at the instance of the procurator fiscal of the jurisdiction, or of the person who caused the analysis to be made from which it appeared that an offence had been committed against some one of the provisions of this Act;

   Every penalty imposed and recovered under this Act shall be paid to the clerk of the court, and by him shall be accounted for and paid to the treasurer of the county general assessment, or the police assessment of the burgh, as the sheriff shall direct;
10. Every penalty imposed by this Act may be reduced or mitigated according to the judgment of the sheriff;

11. It shall be competent to any person aggrieved by any conviction by a sheriff in any summary proceeding under this Act to appeal against the same to the next circuit court, or where there are no circuit courts to the High Court of Justiciary at Edinburgh, in the manner prescribed by such of the provisions of the Act of the twentieth year of the reign of King George the Second, chapter forty-three, and any Acts amending the same, as relate to appeals in matters criminal, and by and under the rules, limitations, conditions, and restrictions contained in the said provisions.

34. This Act shall commence on the first day of October one thousand eight hundred and seventy-five.

35. This Act may be cited as 'The Sale of Food and Drugs Act, 1875.'

CHAPTER XXVIII.

PROPOSED NATIONAL LEGISLATION.

Mr. Beale, by unanimous consent, introduced the following bill in the House of Representatives, May 23, 1879. Read twice, referred to the Committee on Manufactures, and ordered to be printed:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no person, association, company, or corporation shall, within any State or Territory of the United States of America, or within their jurisdiction, manufacture, sell, or barter, or offer to sell or barter, any article of food or drink which, to the knowledge of such person, association, company, or corporation, contains any ingredient or material injurious to the health of persons eating or drinking thereof, or sell or barter, or offer to sell or barter, as pure and unadulterated, any article of food or drink which is adulterated or not pure.

SEC. 2. If any person shall have any reason to believe that any article of food or drink which is prohibited by the first section of this act from being manufactured, sold, or bartered, he shall have a right to demand a sample of such article of food or drink from any corporation, association, or individual having the same in custody, and to present the said sample to the nearest analytical chemist for his analysis; and should the analysis of said chemist exhibit the fact that said articles of food or drink contain any ingredient or material injurious to the health of persons eating or drinking thereof, or that the said articles of food or drink are not pure and unadulterated, the corporation or individual shall pay all expenses attending said analysis, which may be recovered in a summary way before any United States judge or commissioner of any circuit court of the United States, together with all costs which may be incurred. If any person fail or refuse to furnish samples of any article of food or drink which may be in his custody or under his control, which is suspected of containing any ingredient or material injurious to the health of persons eating or drinking thereof, or any article of food or drink which is being sold or bartered, or offered to be sold or bartered, as pure and unadulterated, when the same is suspected of being adulterated or not pure, he may be required by any United States judge or commissioner of any circuit court of the United States to pay a fine not exceeding —— dollars, and, in the discretion of said judge or commissioner, be imprisoned until said fine is paid and said sample furnished.

SEC. 3. Upon complaint in writing being made, under oath, to any United States judge or commissioner of any circuit court of the United States that any person has violated this act, it shall be the duty of such judge or commissioner to issue his warrant, reciting the offense, directed to any United States marshal or deputy marshal, or, in the absence of any marshal or deputy marshal, to any suitable person who may be selected by him, commanding the arrest of such person or persons. Said person so selected, in the absence of any marshal or

deputy marshal, shall have the same power and authority, in making said arrest, as any United States marshal would have. It shall be the duty of the marshal or other person to whom said warrant may be directed forthwith to arrest said person or persons and take them before the nearest commissioner of the United States circuit court, and shall summon all witnesses for or against the persons charged, upon a subpœna issued by any United States judge or commissioner of the United States circuit court, requiring their attendance to testify before the commissioner before whom said person or persons may be brought. Said commissioner shall hear all legal evidence for and against the person or persons against whom the charge shall have been made; and if, in his opinion, the party charged be guilty of a violation of the first section of this act, a fine shall be assessed against him of not less than —— dollars, nor more than —— dollars, which shall be forthwith paid to the said commissioner by the party against whom the offense has been proven to have been committed, or by some one for him, including all legal and proper costs, and upon failure to pay said fine and costs the person against whom the same may have been assessed shall be committed to the jail of the county wherein said offense was committed, or, if there be no jail in said county, to the nearest jail thereto, there to be confined until the said fine and costs be paid, or the party discharged from jail under the provisions of section 5,296 of the Revised Statutes of the United States. If any person or persons be found guilty of a second violation of the first section of this act, he shall be punished by fine not exceeding —— dollars, and imprisoned for a period of not more than —— months. No judge or commissioner shall act in any case under this act outside of the circuit or district over which his jurisdiction extends.

SEC. 4. From any decision of the commissioner under this act the person feeling himself aggrieved thereby may appeal to the district court of the United States having jurisdiction over the county wherein the offense is alleged to have been committed. Said appeal shall be granted by the commissioner upon the application of the party feeling himself aggrieved, or some one for him, if made within ten days after the rendition of the judgment of said commissioner; but said appeal shall not operate as a supersedeas to said judgment unless and until the party applying there or, or some one for him, shall enter into a bond before said commissioner, with approved security, in the penalty of not more than —— dollars, payable to the United States of America, with conditions to pay all damages and costs which may be awarded against the appellant on the hearing of said appeal. Upon granting said appeal all letters relating to the cause shall be by said commissioner forthwith forwarded to the clerk of the district court to which said appeal is taken, and it shall be the duty of said clerk to docket said cause, and the same shall be heard at the first court thereafter, unless good cause be shown for a continuance; the cause shall be heard and determined on said appeal by the judge of said court upon the hearing of all legal evidence for and against the appellant, unless a jury shall be demanded, and if a jury be demanded the cause shall be tried before a jury, as criminal causes in said court are tried, except that no indictment, information, or formal pleadings shall be required.

SEC. 5. All fines collected under this act shall be paid into the Treasury of the United States, and any person receiving and failing to pay over said fines shall be guilty of a misdemeanor, and upon conviction thereof in the district court of the United States having jurisdiction over said cause, shall be fined not exceeding —— dollars, and imprisoned not more than —— years.

SEC. 6. Any person failing to perform any duty required of him under this act otherwise than that which is embraced in section 5, may in a summary way, by any United States judge or commissioner of the circuit court of the United States, be required to pay a fine not exceeding —— dollars, and, in the discretion of said judge or commissioner, imprisoned until said fine is paid.

From the action of any commissioner imposing a fine under this section there may be an appeal of right to the district court of the United States having jurisdiction over the county wherein said commissioner resides.

SEC. 7. All justices of the peace in the District of Columbia, duly commissioned and qualified as such, shall have the same jurisdiction and power, and shall perform all the duties within the said District of Columbia under this act, as by the provisions thereof are conferred upon the commissioners of the circuit courts of the United States; all appeals from said justices to be docketed and tried in the supreme court of the District of Columbia.

CHAPTER XXIX.

CONCLUSION.

In the preceding pages we feel that we have given merely a hint of the adulterations which chemistry and the microscope would show to be practiced by the producers of food and other articles of daily use in the household. To exhaust the subject would require years of research and fairly clog the press of the country to put it in print. Every hour also brings forth its new discovery, and the adulterations of to-day may be supplanted by other and viler ones to-morrow. It is sufficient for us to know that these changes are not in the direction of improvement, nor can they be, so long as the stimulating cause and sole object is the production of a cheap and yet cheaper article, so long as personal reputation, commercial honor, and regard for the public health are all lost sight of in the reckless struggle which has come to be called *competition*.

To fix the responsibility for this most disgraceful state of affairs involves an investigation of the causes, which have brought it about, as well as the circumstances which encourage its continuance.

To profitably dispose of an article for less than it should cost, involves one of two things, either that it has been dishonestly obtained, or has been dishonestly manufactured, *i.e.*, that it is not *really* what it is represented to be. When the jobber or wholesale dealer orders from the manufacturer ground black pepper, for instance, with the understanding that it is to be billed to him at 8 or 10 cents per pound, he is simply instructing the manufacturer to supply him with something that is not purely or honestly black

pepper. He knows the unground spice, to say nothing of the cost of grinding, packing, etc., cannot be purchased by the manufacturer himself for less than 15 cents per pound. And when the jobber disposes of this pepper to the retailer he does it, knowing that it is an impure and adulterated article. Here the knowledge of the fraud sometimes ends, but more frequently the retailer is also wittedly and willingly a party to the swindle. He purchases the article simply because it is cheap, and if he has the intelligence which he should possess, he knows that it is cheap because it is impure. This fraudulent pepper has now reached the consumer. What is his or her knowledge or responsibility in the premises? The only knowledge here is that the article is cheap and very rarely indeed is a thought beyond this bestowed upon the subject. The question of *why* it is cheap seems rarely, if ever, to suggest itself.

And now tracing this so-called pepper back to first hands again, what have we found? On the part of the consumer, ignorance. In the case of the retailer, occasional ignorance, but more frequently a guilty knowledge. With the wholesaler or jobber, full knowledge and instruction to the manufacturer, and finally with the manufacturer implicit obedience to "the demands of the trade."

If ignorance of the laws of health, like ignorance of the civil law, is no excuse, are we prepared to say that, constructively at least, we have not here a complete chain of guilt and accountability, all the way from the manufacturer to and including the consumer?

The premium upon fraud and adulteration would seem to be placed by the consumer, who, casting all other considerations aside, demands only that which is cheap. Did he or she but consider, for a moment, the fact that the difference in the price of articles of the same name is not in the shops, nor in the dealers, where and by whom they are offered for sale, but in the articles themselves, the important consideration of quality would suggest itself as paramount to the consideration of price.

If the article labeled "pepper" and offered at retail for 10 cents per pound *was* pepper, it would be cheap indeed. But when it consists of barely one-half pepper and the balance wheat middlings, its cheapness becomes very questionable since the purchaser obtains, in fact, only half a pound of pepper for his money.

In this case, as in many others, we are forced to the conclusion, that the responsibility for the adulteration rests very largely with the consumer. He has created the demand for the cheap and

impure stuff. He has not stopped to think that that which is worth something costs something, but has allowed himself to believe that the seeming give-away price of the article he has purchased signifies only "a good bargain." The individual who returned the sugar to his grocer with the observation that there was too much sand for sugar, but not enough for building purposes, arrived at a very correct estimate of the value of many of the fraudulent mixtures to be found in the shops. In the case of the consumer whom we have instanced above, a slight investigation might have convinced him that there was too much wheat in the pepper for a spice, and too much pepper in the wheat for baking purposes.

But while we are disposed to hold the consumer accountable, in a large measure, for the frauds that are practiced upon him in cases such as we have cited, there is a much larger class of cases in which he does not in any sense share the responsibility with the manufacturer and the dealer. When he pays the full market price for butter and is given for his money the cheap, if not impure and unwholesome substitute, oleomargarine; when he is given glucose for cane sugar, cane sugar syrup and for honey; when he is poisoned with sulphuric acid and the salts of lead and tin in these adulterated sweets; when he is allowed to take into his family dangerous compounds so adroitly put together that none but the practical chemist can detect their character and tell their effect; when he is allowed to give to his children confectionery, colored with deadly pigments; in short, when he receives from his grocer that which at the hands of his druggist would be labeled with the ominous skull and cross-bones, his accepting or even demanding the article, does not excuse, in the least, the manufacturer or purveyor, or furnish any reason why they should not be severely punished for producing and serving such articles in the guise of food.

The causes which have brought about and continue to foster these vicious and fraudulent practices would seem to be: First, an ignorant demand on the part of the consumer for cheap and adulterated stuff; second, unscrupulous acquiescence on the part of the manufacturer to every demand of the trade; and, third, a desire on the part of both manufacturer and dealer to enrich themselves by the illegitimate profits derivable from illegitimate pursuits.

To arrest these practices, then, it becomes primarily important and necessary, that the public should be informed, that an intelligent sentiment should be awakened which shall condemn not only

the corrupted and fraudulent article, but those who produce and offer it for sale.

Mr. Angell, of Boston, the foremost laborer in this much-needed reform, has suggested the organization of Protective Health Associations, as the quickest and surest method of eradicating the evil. We can see how such societies might accomplish, locally at least, a vast amount of good. They could and no doubt would do much toward disseminating the much-needed information. They might also go further and institute prosecutions under existing local laws and expose both the manufacturer of, and dealer in, adulterated food. But in the opinion of the writer their greatest service would be rendered as a factor in arousing a sentiment that would demand national health-protecting legislation and in insisting upon the enforcement of such laws when enacted.

Such associations would, we believe, find active and faithful allies in the honest manufacturers and would-be honest dealers, a by no means small or uninfluential class. The writer cheerfully bears witness to the fact that even many of those who regard themselves as having been driven into adulteration as an alternative to being driven out of trade, have expressed themselves most emphatically and earnestly as favoring national legislation that would make the practice a crime.

"This constant cheapening of goods by the introduction of foreign substances has been carried to such an extent that there is no longer any profit in it."

"We supply our customers with higher-priced and better goods in every case where we can induce them to take such."

"I would sooner sell a purer article and make a smaller profit, for, then there is no danger of it's coming back on my hands."

"We used to hold our customers much longer than we do now. There were two reasons for this: The goods gave better satisfaction, and prices were more uniform."

"I would give a six-months' earnings, or, I would write my check for $1,000, if it would secure the passage of an honest anti-adulteration law."

"I would vote to-morrow to make the adulteration of any article of food in any manner whatsoever a felony."

"I would gladly quit the miserable practice, if my neighbors would allow me to."

These are all expressions the writer has heard direct from the lips of manufacturers who are more or less guilty of adulterating their products, and he does not doubt that in every instance they

were uttered in perfect sincerity. If such is the sentiment entertained and expressed by this class, what may we not look for from that other class, who, despite all temptation to do wrong, have continued to do right—the manufacturers of really pure articles?

We have referred briefly at the inception of this work to the moral effect and the effect produced upon the commerce of a country by this wholesale sophistication of its products. We can but echo the sentiment of Dr. Piper, that "the moral tone of the whole community is lowered by the contemplation of such practices passing constantly under its notice."

The English Parliamentary Committee on Adulteration, of 1855, stated in their report: "Not only is the public health thus exposed to danger, and pecuniary fraud committed on the whole community, but the public morality is tainted, and the high commercial character of the country seriously lowered both at home and in the eyes of foreign countries."

Can the evil be eradicated? We believe that it can. All great reforms must begin with the people, and this reform is no exception. By the dissemination of intelligence and the correction of popular errors the demand for the cheap and impure mixtures sold as food can be greatly diminished, if not prevented altogether, and with its outlets thus cut off, the evil will, in a great measure, correct itself. A higher intelligence will also demand and secure such legislation as is needed to suppress the baser and more subtle arts, which baffle and must continue to baffle all efforts at detection outside of the laboratory.

If these pages shall in any measure contribute to this result, the writer and the publishers feel that they will have deserved the substantial recognition of the public.